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1386

PROBLEMS

OF

LIFE AND MIND.

PROBLEMS

OF

LIFE AND MIND

BY

GEORGE HENRY LEWES

Third Series
(*Continued*)

PROBLEM THE SECOND

MIND AS A FUNCTION OF THE ORGANISM

PROBLEM THE THIRD

THE SPHERE OF SENSE AND LOGIC OF FEELING

PROBLEM THE FOURTH

THE SPHERE OF INTELLECT AND LOGIC OF SIGNS

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PREFATORY NOTE.

THE present volume represents all the remaining manuscript for *Problems of Life and Mind* so far as it was left by the Author in a state that he would have allowed to be fit for publication. Much of it was intended to be rewritten, and the whole, if it had undergone his revision, would have received that alternate condensation and expansion sure to be needed in a work which has been of many years' growth, and which treats of a continually growing subject. Some repetitions would have been avoided, many arguments would have been better nourished with illustration, and in the Third Problem there would doubtless have been a more evident order in the succession of chapters, the actual arrangement being partly the result of conjecture. The Fourth Problem, of which the later pages were written hardly more than three weeks before the Author's death, is but a fragment: it will perhaps not be felt the less worthy of attention by those readers who have followed his previous works with interest and sympathy.

In correcting the proof-sheets of this volume the Editor has been generously aided by Dr. Michael Foster and Mr. James Sully.

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PROBLEM II.

MIND AS A FUNCTION OF THE ORGANISM.

> "The method of composition remains the same throughout the entire fabric of Mind, from the formation of its simplest feelings up to the formation of those immense and complex aggregates of feelings which characterise its highest developments."
>
> HERBERT SPENCER: *Principles of Psychology*, i. 184.

MIND AS A FUNCTION OF THE ORGANISM.

CHAPTER I.

INTRODUCTORY.

1. We know that the thoughts and feelings of other men are both like and unlike our own thoughts and feelings; we know that their mental processes are like ours, and that the products of such processes vary with variable experiences; we know that our own minds are not what they were in early days, but have grown and developed under conditions similar to those which have determined the growth of other minds. From all this we conclude that human experiences have much that is common and constant, underlying much that is particular and fluctuating. It is to what is common and constant that investigation is mainly directed; the facts of Sensibility are only interesting to us in so far as they disclose the Laws of Sensibility.

2. The first common fact and the most fundamental is that our psychical activity is the expression, 1°, of the action of the external medium on the organism, and, 2°, of the reaction of the organism. These two factors, Organism and Environment, abstraction detaches and considers apart, as if each

existed separately; so that we are led to think of the organism as if its relation to the environment were merely casual, and of the environment as if its recognisable manifestations were not shaped and coloured by the organism. The Laws of Sensibility are thus detached from the Laws of Matter, as if the Modes of Reaction were independent of the Modes of Action. This procedure has its necessity and its advantages. All that is requisite is that we should understand its artificial nature. When that is forgotten, many confusions arise. Among them there is the mistake of supposing that the Modes which are *immanent* in the conditions are *independent* of them, and exist *à priori*. Because human actions are found to obey legislative prescriptions, the operative forces of Nature are supposed to obey Laws; these Laws, *i.e.*, the abstract expressions of the forces in action, are supposed to be a higher order of existents mysteriously controlling the forces. And so with the Mental Laws. Implicitly, or explicitly, they are assumed to be a higher order of spiritual forces which act on and determine experiences. Because we can translate the concrete facts of Sensibility into the abstract expressions of what is common to them all, it is often imagined that this translation reveals the *à priori* origin of the abstracts.

3. Without here entering on a discussion of this metaphysical question, which can only be settled by a scientific Psychology, we pass directly to the second fundamental fact needful to be always borne in mind, namely, that all psychical phenomena are phenomena of the sentient organism, and the various classes into which we group them are Modes

of Sensibility. If we view these phenomena on the physiological side, they are bodily facts; if on the psychological side, they are facts of Feeling.

But here an explanation becomes necessary. By the term Feeling, most readers will understand something more than the activity of the organism, which we call Sentience; they will understand by it what is usually termed Consciousness. Not only so, but they will also doubt whether Feeling is the proper term for the whole activity of the sentient organism, inasmuch as there is, on the one hand, the activity which is unfelt, being unconscious; on the other, there is the activity of Thought.

The extreme laxity with which the term Consciousness is employed, even in philosophic writings, will be noticed in the concluding chapters of this Problem. Enough here to remark, that whereas the term is often used as the synonym of Sentience in the widest sense, it is also used for a special mode of Sentience. So that while one school declares that "to have a sensation and to be conscious of having it are not two things, but two names for one and the same thing"—another school speaks of unconscious sensations, unconscious reasonings, and unconscious actions, and declares that "to be conscious of any sentient state is to attend to it, to reflect on it."

4. In this dilemma we shall do well to avoid the term Consciousness, and keep to the less ambiguous term Sentience, which, as the activity of a sentient organism, admits of the needful precision. But how about the antithesis between Feeling and Thought? There are many philosophers who interpret this antithesis as meaning that Feeling in some mysterious

way comes from the Body, whereas Thought has a purely spiritual origin in the Mind. The reduction of both to Modes of Sensibility will seem a complete destruction of the spirituality of our higher functions. That reduction, however, is the irresistible conclusion of the scientific principles of a biological Psychology. It is, indeed, in opposition to the view held by the majority of psychologists, and by the general public, a view thus expressed by Reid in his opening essay: "By the mind of man we understand that in him which thinks, remembers, reasons, wills." What *that* is he professes not to know; and yet, by a common illusion, in the same breath professes to know vaguely what it is, and certainly what it is not. He knows that it is "one internal principle," and that it is not the human organism. "We are conscious that we think and have a variety of thoughts of different kinds, . . . all of which we are taught by nature to attribute to one internal principle, and this principle of thought we call the mind or soul of a man." Are we taught this by Nature? or not rather by speculative philosophers?

The natural teaching of observation and induction discloses no trace of an internal principle. From among the various operations of the organism which are classed as vital, a particular group is detached and named mental. To personify the one class as an internal principle, Life, and the other also as an internal principle, Mind, and then to assign all the observed operations *not* to the organism which is known to be in action, but to those principles which are imagined, is not the teaching of Nature but of the Schools. *That* which thinks, reasons, wills, is the organism; precisely as *that* which indicates time by movement of hands on the dial-plate is the clock mechanism, not an internal principle; although we may, if we will, personify the actions of the mechanism and call this the source of all that is observed in the clock. The clock is a material object or a social object according to our view of its adjusted structure or its social function. The living organism is in like manner a physical object or a psychical object according to our physiological or psychological view of its operations. Yet when the reduction of Feeling and Thought has been effected, it will still leave the antithesis to be explained.

To explain it, we had better avoid cramping ourselves by definitions. A philosophical mathematician, M. Cournot, has suggestively noted the difference between clearness of conception and clearness of definition.* The ground of this is that a conception is a *generalised* point of view which embraces all that is known in particular of an object or a process; whereas a definition usually is an *abstract* point of view arising at the expression of some few well-marked particulars: it is therefore imperfect in proportion to its particularity. Hence the truncated appearance of our conceptions when presented in definitions. Many ideas which are without equivoque or obscurity lose their clearness directly they are fixed in rigid verbal limits. For example, every one knows what is meant by Feeling, Sensation, Intelligence, Will, &c.; yet all attempts to define them have been unsatisfactory. One may say of them what St. Augustine said of Time, "If you do not ask me, I know; but if you ask me, I do not know."

---

* "Un concept existe dans l'entendement indépendamment de la définition qu'on en donne; et souvent l'idée la plus simple dans l'entendement ne comporte qu'une définition compliquée, quand elle n'échappe pas à toute définition. Tout le monde a une idée directe et exacte de la similitude de deux corps, quoique peu de gens puissent entendre les définitions compliquées que les géomètres ont données de la similitude."—COURNOT: *Des Fonctions et du Calcul Infinitésimal*, 1841, vol. i. p. 72.

When just now Feeling was suggested as the equivalent of the activity of the sentient organism viewed subjectively, that suggestion presupposed it to be already known, clearly conceived. There was no specification of its characters. To get at these we must study the activities. On a general view we observe that Feeling sometimes means the sensations of Touch, Temperature, Dryness, Humidity, &c.; sometimes the visceral sensations; sometimes emotions, sentiments, and intellectual states. We are said to have a feeling of Terror, a feeling of Justice, and a feeling of the logical correctness of a conclusion. There is obviously a marked difference between feeling the hardness, smoothness, and coldness of a statue and feeling its beauty; between feeling anger and feeling hunger; between feeling that Leonidas was heroic and that Darwin's hypothesis illuminates Biology. But since men in all ages and in all countries have given this extension to the term, we may conclude that there is some deep-seated community in the diverse cases to which it is applied. If sensations, perceptions, emotions, sentiments, volitions, and ideations have all in turn been recognised as feelings, there is good reason to suspect that Feeling is a *generalised expression for what all mental states have in common.* As such it will be understood in these pages.

5. If the reader objects to this extension of the term Feeling and its inclusion of Thought, usually understood to be the antithesis of Feeling, he may be reminded that psychologists have very generally obliterated the antithesis on the other side by making Thought the generalised term for all mental states. Thus Reid in defining mind as that which thinks adds: "We have a variety of thoughts of different kinds, such as seeing, hearing, remembering, deliberating, resolving, loving, hating, among other kinds;"—and further, "By the operations of the mind we understand every mode of thinking of which we are conscious." Thus sensation, perception, conception, emotion, and volition are, according to him, all different kinds of thinking; which is acceptable if we understand by thinking all mental operations. I have merely substituted the term Feeling because it seems less ambiguous; and having done so, will proceed to state how Thought may be understood to be classed under the more comprehensive head of Feeling, and yet as such have a special meaning of its own, which special meaning may even at times seem almost the antithesis of Feeling.

All Experience is resolvable into states of the sentient organism. These states are primary, secondary, and compounds of primary and secondary. A primary state of sensible affection becomes a sensation or a perception when compounded with secondary states, the more or less energetic revival of the residue of former primary affections. It is then classed under the Sensible. When the state is not directly determined by a primary sensible affection it is classed under the Ideal. But in both sensible and ideal states the same neural processes are in operation, it is the same Sensorium that is in activity. As we analytically detach the ideal from the sensible, so we detach the process of stimulation from the process of grouping, the one standing for the receptivity the other for the activity, and thus the one comes to represent Feeling and the other Thinking, the one Sense, the other Logic.

6. But while thinking is really a Mode of Sentience, a particular form of the general activity named Feeling, common usage has decided that Thinking should be the antithesis to Feeling. This usage we must respect. It may be respected without ambiguity if we understand that when Thinking is classed with Feeling it is in virtue of the *process* or function common to both; when classed in antithesis to Feeling, it is in virtue of the *products* of the operations. Thoughts as products are readily distinguishable from sensations or emotions as products, although the laws of grouping which are manifest in the one are equally manifest in the other. Thoughts differ from sensations as signs from the things signified; but the processes by which they are combined are of the same nature, whether the products be sensations or perceptions, perceptions or conceptions.

This antithesis of process and product may be illustrated by the similar artifice of the vegetable physiologist who says that the green sepals of the calyx of a geranium are the same as the green leaves of the frond, and both again are the same as the coloured petals, pistils, and stamens. He does not mean that these various modifications of a common type are not separately distinguishable, but that they have all a common origin and common laws of evolution. As products, the pistil is not the sepal, the stamen is not the leaf. As products, a conception is not a perception, an emotion is not an idea. But the processes of evolution are processes in common. There are stages in the development of a pistil in which its community with the leaf is evident; there are stages in the development of a conception in which its community with perception and sensation is evident.

That this double application of the term Feeling is capable of serving our purposes without great ambiguity may be seen in the analogous application of the term Animal, which, although including Man, is often employed as the antithesis to Man. Considered as a physical being, Man is classed under Animal, because he has in common with animals all the general zoological characters; but considered as a spiritual or intellectual being, he is detached from and contrasted with animals by reason of certain special characters. Some readers will be shocked to hear thoughts spoken of as feelings, just as their forefathers would have been shocked to hear man called an animal. Their remote ancestors would have accepted both statements without hesitation, and we may also accept them when duly qualified. We must do so when we learn, as we may learn, that the processes of combination fundamental to thinking are necessary for all the products classed under Feeling and Willing—in a word, that all psychical phenomena are manifestations of the sentient activity of the organism, all have a common seat, all follow the same laws.

7. We do not thereby obliterate the phenomenal differences. Thought is specially allotted to combina-

tions of secondary states. Having established the distinction of terms, men easily came to personify Thought as a distinct agency. Images and ideas of objects are so decisively distinguished from the sensible affections produced by the immediate action of those objects (they arise in the absence of the objects, and admit of combinations and distortions unknown of the objects), the state of consciousness in the two cases is so different, that a corresponding difference in terms becomes indispensable. Ideas are symbols which have a general, impersonal significance; they are therefore intelligible to other minds; whereas sensations are only sensible to the organism then and there affected by the objects. To see my horse grazing in the field, to imagine it there, and to think, speak, or write the word expressive of these external facts, obviously imply different states of Sentience. We call the first Perception; we analyse it into the sensible affections produced by the horse, its motion, the field, the sky, &c. On close examination, indeed, it turns out that these sensible affections are not all primary states, but are states compounded of primary and secondary states—reproductions, associations, abstractions, judgments, all of which involve the logical function, since to *re*-cognise the object as a horse, its motions as those of a horse grazing, the field and sky, it is necessary that a vast consolidation of previous experiences should have taken place. Out of mere stimulation of the sensory organ no perception could have arisen. Other processes were needed. Nevertheless we leave all these out of account, and classifying the phenomena by their dominant characters of immediate sensible affection, we regard the sight of the grazing horse as due to the reaction of the visual organ, and call it a sensation or a perception.

An analogous, but inverse, elimination takes place in the second case. I am seated in my study; no vision of horse and field is effected, the objects not being sensibly present; yet, owing to some internal stimulation, my Sensorium is affected, and the objects are ideally present: I see them, but with a difference. I do not believe that they are actually impressing Sense, my present state being *other* than that which the actual impression produced; but I am persuaded that the objects exist, and may be visually felt if the due conditions are complied with. Nay, if the horse has been removed or is dead, I still can recall the image at will. Hence arises the experience of a subjective world of Thought, which is independent of the objective world of Sense. I know that the images were originally produced by sensible affections; but now that they are reproduced by some other causes, I leave the original production out of account, and fix attention only on the causes of reproduction.

This becomes more marked in the third case. Here verbal symbols replace the images, as the images replaced sensible impressions. In uttering or writing the phrase, a very faint evanescent image of the horse or the field may have arisen, or it may not. The words will suffice. Now as words are symbols which condense a vast amount of primary and secondary states, the distance between Thought—the grouping of such symbols—and Sensation—the grouping of impressions—is extreme. And for such marked differences different terms are needed.

8. It is unfortunate that the term Thought is applied sometimes to the act of Thinking, as a mental process, and sometimes to the ideas produced by the act. The Greek work τόκος likewise means both birth and child, as τόνος means both tension and rope, and λόγος the power which combines thoughts and the product of such combination. Thought has, in philosophic writings, also the signification of Intellect (Das Denken). We shall do well to remember that the process is to the products what Grammar is to Language. The laws of Thinking, like the rules of Grammar, are simple and uniform; the products are various.

We may therefore preserve the familiar antithesis of Feeling and Thought, as we preserve that of Animal and Man, while fully alive to their fundamental identity. Feeling has its laws of Grouping, its Logic. Thought has its laws of Operation, its Logic. These represent the organic process. As products the two are different. Thought is a Mode of Sentience, either as the combination of secondary reproduced states undirected by primary states, *i.e.*, Imagination, or as the combination of symbols only, *i.e.*, Ideation. It thus differs from all other feelings; but Sight differs from Hearing, Hunger from Grief, yet all are feelings.[*]

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[*] It is from a confusion of these two points of view that the controversy respecting Innate Ideas was so long sustained. Descartes, the chief of the *à priori* school, explained his meaning in this passage, which might have formed the epigraph to Kant's *Kritik*: "Je n'ai jamais écrit ou jugé que l'esprit eût besoin d'idées innées qui fussent *quelque chose de différent de la faculté de penser*. Mais comme je remarquais qu'il y avait en moi certaines pensées qui ne provenaient pas des objets extérieurs, comme les idées adventices, ni de la détermination de ma volonté, comme les idées factices, mais de la seule faculté de penser qui est en moi, pour dis-

9. We now pass to the third fundamental fact which must always be distinctly present to us in our investigation. The reactions of the organism are determined by the inherited structure of the sentient mechanism; but from the first entrance into the world the mechanism is incessantly undergoing modification, so that in time there is a very different structure to react on the external stimulus. We are born with certain organs and dispositions; some of our primitive tendencies are strengthened by exercise, acquiring greater energy and wider range; some of them are transformed, and give place to quite new tendencies. The mind is a growth and a development—as the body is. Because men inherit a common structure, and are inevitably placed under similar conditions of stimulation, they have common experiences and develop common faculties. We all see distances, movements, forms, colours; we all gain the same intuitions of coexistence and succession, of space and time, of causality, &c.; we are all praised and blamed; we all struggle and are hurt; we all find pleasure and pain following certain actions; we all feel our dependence on others. But it is necessary for the development of these dispositions and intuitions that there should be a certain *order* in the succession of experiences. Even the instincts of animals may be undeveloped if the

tinguer les idées ou notions *qui sont les formes de ces pensées* d'avec les idée adventices ou factices, je les ai appelées *innées*, dans le sens où nous disons que la générosité est innée à certaines familles, et à certaines autres telles maladies, non pas que les enfans de ces familles, souffrirent de ces maladies dans le sein de leur mère, mais parcequ'ils naissent avec une certaine disposition ou faculté à les contracter." *Œuvres*: (edit. Garnier), ii. 104.

stimuli be withheld at the proper moment: the cry of the mother fails to move the offspring, fails to have more significance for it than any other sound, if the first few days be suffered to pass over without the offspring hearing this cry.

10. By this, and many other indications, we learn how the structure is modified by the integration of impressions. Each integration is, so to speak, a new organ. And as there are many such, every fresh stimulation finds a network of organs ready to respond, and the final issue of any stimulation is the resultant of a complex of forces. The individuality of each mind is the expression of this complex network. The difficulty of psychological analysis is due to the variability of the network, because while we know that each organism reacts according to its native and acquired dispositions, we cannot know what these precisely are in any one case, nor in what degree the various threads of the network are in action. Compare the very different effects of an appeal to a man's appetite by the presentation of food when he is hungry and when he is satiated; or of an appeal to his generosity when he has dined and the same appeal before dinner! These are rude illustrations of a variability of reaction which is observable throughout. The point to be remembered is, that although for analytical purposes we are obliged to assign each feeling and each action to a definite organ, this organ is in reality but the representative of the whole organism, and the whole organism has not a constant but a variable power of reaction.

11. In the complex of excitations which follows

any one impression there are neural tremors of all degrees of intensity,—there are feelings and nascent feelings, with contractions and contractile tremors excited by them,—there are conscious and unconscious dispositions determining the resultant. Every sensation, every thought, has its escort of nascent sensations and thoughts. And it is worthy of remark, that while so many psychologists are inclined to limit psychical phenomena to states of Consciousness, the biological psychologist finds reason to conclude that the unconscious states play by far the greater part in mental life. As the impressions become integrated and experiences organised, there is a gradual fall from the conscious to the unconscious state, so that the perfection of mental processes, as of other organic processes, is their becoming automatic.

Before attempting any analysis we shall do well to examine the organism and its activities from the more general point of view, and see how Mind is a function of the organism. Our first inquiry will be into the Laws of Sensibility; and as an introduction to this we must consider the question recently raised, whether Sensibility is, or is not, to be limited to organisms.

CHAPTER II.

THE UNIVERSALITY OF LIFE AND MIND.

12. PHILOSOPHICAL students must have noticed that, in quite recent times, side by side with the doctrine of Evolution, a strong current has set in which threatens to sweep away all the ancient landmarks, and to necessitate a new classification of conceptions. From the most distant points, from diverse schools, supported by arguments now severely logical and now wildly fanciful, now mathematical and now metaphysical, speculations converge towards the hypothesis that Mind and Life are not confined within the narrow limits of the Animal World, not even within the wider limits of the Organic World, but are essential attributes of the whole Cosmos. A chorus of many voices (not always accordant) proclaims that if the Law of Continuity is true, and if the doctrine of Evolution is true, then these force the conclusion that all Nature is alive and sentient.

This hypothesis I propose to examine first in respect of its evidence, and next in respect of its advantages to philosophy. The evidence might turn out to be wholly inadequate, yet if the hypothesis itself had manifest advantages, in binding together certain isolated conceptions or in indicating novel lines of search, we should gladly welcome it. On the other hand, the evidence might seem very strong, yet if the hypothesis itself, when accepted, were seen to be without these advantages, and left all our old conceptions undisturbed, we should say that, for the present at least, it must be left in the limbo of fanciful speculation.

13. Theologico-metaphysical speculation, pursuing its untrammelled course from generalisation to generalisation, always finally reaches Pantheism. It sees God everywhere and in all things, because it is coerced by the logical impossibility of separating God from Existence or Existence from God. That this resolution of all things into one, of Nature into God, is a contradiction to all our experiences of a manifold, and a destruction of all theological conceptions, requires no proof. Psychologico-metaphysical speculation, by a similar course, untrammelled by the distinctions of sensible experience, easily arrives at Panpsychism. It sees Sentience everywhere, and only recognises differences of degree. That this resolution of all diversities into an universal identity is the destruction of scientific classifications, I shall endeavour to prove.

The hypothesis rests upon an arbitrary extension of terms, and upon an exclusive selection of one order of conceptions. By a sufficient elasticity of terms we may easily reduce all diversities to identity: all things are alike if you disregard their points of unlikeness; because all things have certain aspects in common, if only by reason of their apprehension by a common sensibility. Further, all things as existent must have existence in common, and this community is conceived as continuity. Minds strongly impressed with this aspect, to the exclusion of the other, regard the so-called Law of Continuity as the major premiss of all deduction. In this light they see that if Sensibility were suddenly to arise in the evolution of Life, or if Life were suddenly to arise in the evolution of the Cosmos, there would be a violation of the Law of Continuity; and as such a violation is not admissible for a moment, they conclude that Life and Mind are present from the first, and that the more conspicuous manifestations are simply the results of evolution. From man to animal, from animal to plant, and from plant to crystal, there is a descending scale of intensity and complexity in vital and psychical phenomena, but nowhere is there more than a difference of degree.

14. As to the evidence. Although we only know Consciousness in ourselves, we have no hesitation in assigning it to other men. On similar grounds, we assign a somewhat different, yet essentially similar, Consciousness to animals, at least to the higher animals. When we pass from the anthropoid apes, the dogs, horses, rats, and other intelligent creatures, to the oysters, polypes, and infusoria, our confidence becomes a little shaken: the intelligence of an oyster or the sensations of a polype are with difficulty admitted, but we fall back on the Law of Continuity, and on the evidence of Sensibility manifested by oysters and polypes. We have here already extended this elastic term to its utmost, as meaning simply a vital property; but we can recognise in it that which is common to all manifestations classed under Sensibility, namely, the *transformation of a stimulus into a movement of self-conservation.*

Descending still lower, and finally reaching the simplest of all organisms, constituted apparently by nucleated protoplasm, these microscopic dabs of living jelly exhibit the lowest known grade of Sensibility. It is because the protoplasm of the human nerve-centres is fundamentally similar to that of these lowest of all organisms, that we include both under the same general denomination of Animal, and from this point of view regard Sensibility as co-extensive with the animal world.

15. But having travelled thus far, must we stop here? Can we exclude the Vegetal World from all participation in Sensibility, since we admit its participation in Vitality? If there is a conspicuous contrast between the phenomena exhibited by one of the higher animals and one of the highest plants, it is hardly more conspicuous than the resemblance which may be noticed between the lowest grades of the two kingdoms, or than the organic superiority of a plant to many animal forms. Indeed, that plants have Sensibility is freely admitted by many moderns. That they have Souls is maintained by a few, and among the few by the admirable Fechner. I see very cogent reasons for assigning Sensibility to plants, but every reason for denying Souls to them, so long as the term has any special significance.

16. Plants are constructed out of organic substances, and these are organised into anatomical elements, which closely resemble in all essential points the organic substances and elements of animals. With this structural resemblance there go certain corresponding functional resemblances. Of these, for the present, we need only notice the spontaneous

movements and the reflex actions. I presuppose the reader's acquaintance with such facts, and pass on to the strikingly illustrative fact that plants and animals not only exhibit similar signs of Sensibility, but these signs are in both diminished and arrested by anæsthetics. Touch the eye of a frog, and there is at once the response of a reflex closure of the eyelid. Touch the hairs of a sensitive plant (*Mimosa pudica*), and there is at once the response of a reflex closure of the leaf. The frog swallows a fly and digests it; the mimosa grasps an insect and digests it. Confine the frog and the mimosa under a glass shade, and place there a sponge over which ether has been sprinkled. Both plant and animal breathe this air in which there is vapour of ether, and as this vapour penerates to their tissues we observe a gradual cessation of all Sensibility; first the reflex actions cease, then the irritability of the particular tissues ceases. Stupor has supervened for both. Now remove the glass shade: the vapour dissipates, the fresh air penetrates to the tissues in exchange for the vitiated air, and both frog and mimosa slowly recover their Sensibility.

17. This experiment points to two important conclusions. First, that the animal and plant organisms have with their common structure common properties, and that if we call one of these properties Sensibility in the animal, we must call it thus in the plant. Secondly, that the property in question is only manifested when the structure combines *a definite group of conditions*, and is the expression of this group only, so that a very slight change in molecular arrangement suffices to annihilate the pro-

perty. The bearing of these conclusions will be manifest presently.

The structure of the plant differs from that of the animal in many and important details, with corresponding differences in properties and functions; it also agrees in certain fundamental points, namely, in a ground substance of protoplasm, and a cellular configuration of elements. As we are now disregarding differences, we seek in the cells and protoplasm for the conditions of Sensibility in both. Our only guide is of course experiment. What does experiment disclose? It discloses that the effect of ether on the cells is one which when sufficiently profound becomes visible as a condensation of their protoplasm, which it renders opaque. This apparently trivial molecular alteration is the condition which robs the protoplasm of all its specially vital activities: not of Sensibility only, but of all, since the etherised plant ceases to breathe, the etherised yeast-cell ceases to act as a ferment, the etherised grain or ovum ceases to germinate. That this is so is shown by the reversal of the process. As the effect of the ether is dissipated, the protoplasm resumes its previous condition and appearance, becoming again transparent, and at the same time resumes its vital activities: the grain germinates, the yeast ferments, the plant and animal breathe and move.

18. It is clear from what has just been said that, disregarding their manifold differences, we are fully justified in regarding plants and animals as having in common the attributes of Vitality and Sensibility—a conclusion enforced by the impossibility of drawing a line of demarcation between the plant

and animal organism. So far good. We have been tracing the results of experience along one line, that of manifest resemblances. We have now to complete the investigation by tracing the results of experience along the other line, that of manifest differences. Founding on these, and on the biological principle that property and function are rigorously dependent on structure,—which is only a special application of the more general principle that every phenomenon is a function of its conditions,—we conclude, *à priori*, that the Vitality and Sensibility of the plant, although *generically* similar, are *specifically* unlike the Vitality and Sensibility of the animal; and that these specific differences demand terms of equivalent significance. One such term is Soul, the abstract of many concretes, each of which may indeed be referred to a basis in Sensibility, but each of which has its special conditions not found thus combined in other cases. We have no more justification in assuming the presence of a Soul where we find Sensibility, than in declaring the acorn to be an oak, because out of that acorn, as a starting-point, the oak may be evolved by the concurrence of many conditions: the oak exists as truly in these other conditions as in the acorn.

19. Even in speaking of the Sensibility of plants and the lower animals, we must remember that it is a very generalised expression, stripped of much that specially characterises it when applied to human beings. The Sensibility of the plant and the mollusc shows no sign of an organisation of impressions reproducible by Memory — no residual experiences. It comes within the general definition—the reaction

under stimulus as a movement of self-conservation—but that is all. As such, it is the basis or forerunner of the higher manifestations. The sensibility and contractility exhibited by a polype moving towards the light and retracting its tentacles when touched are not to be interpreted as more than generically similar to the sensations and muscular contractions of a man. Human sensibility is the product of a slow and numerously seriate evolution. If at its starting-point we find protoplasm common to plants and animals, at the close we find this protoplasm enormously multiplied and differentiated, its powers enlarged and varied at each stage of multiplication and differentiation, so that new orders of phenomena successively appear. For many theoretic purposes it is useful to group the amœba in the same division as the ape, and the ape beside the man; but no one without an effort is able to set aside all the conspicuous differences, and to think of an amœba and a man as having anything in common: when he succeeds in doing so, he is careful to keep before him the reasons which determine his conclusion. Otherwise, to begin to argue from the amœba to man, or from man to the amœba, would be to begin an endless confusion.

20. This premised, and the Sensibility of plants granted and explained, we pass to the inorganic world. For those thinkers who disregard the differences and pursue only the traces of community, it is easy to find an insensible transition from plants to crystals. Organic bodies, they remark, are constituted by the same elementary substances as the inorganic bodies, and these substances have in both the same properties. The molecular activities of

metals and earths are recognisable in plants and animals. In both there is the community of Matter and Force. The manifestations we ascribe to Feeling in organisms have a general resemblance to those we ascribe to Force in anorganisms. And if the Law of Continuity is true, there can be no break, nothing but gradations of complexity.

21. Glisson, who introduced the term Irritability, conceived that Matter had three essential properties—it was *perceptiva, appetitiva, et motiva.* Is not this anthropomorphism? It has been reproduced in late speculations which consider the irritability of plants as identically the same molecular disturbance as the sensibility of animals, and thence conclude that all molecular disturbance is evidence of sensibility. One body acts on another and reacts. The *impression* thus made and the subsequent *reaction*, having common terms when applied to organisms or anorganisms, these common terms are interpreted as evidence of identity. Identity there is, but only in one relation. The special conditions of each particular phenomenon are left out of account, and the movement which is common to all is the one relation that is expressed. "We do not know what goes on in bodies when impressed and reacting." Very true; and therefore we should be very cautious, and not rush into suppositions at variance with all we do know; not suppose that what is Feeling in us is Feeling in them, merely because in both there is a molecular change.

Stretching terms, it is easy to identify Life with molecular change, and then conclude all things to be living because all things undergo molecular changes.

But the biologist must protest against such manipulating of conceptions. For him the term Life expresses a vast class of phenomena never found except in definite groups of substances undergoing definite kinds of molecular change. The crystal is not alive, because it does not assimilate, reproduce itself, and die. No combination of substances is alive unless it is a combination which admits of these manifestations. Molecular changes of infinite variety do not suffice. Life is something particular in the general web of molecular change. Any one choosing to stretch terms may say that molecules live because molecules exist. But in that case we shall have to create a new term for the mode of existence which is now called Life. We cannot say that molecules assimilate, reproduce, and die. Such phenomena are exhibited only by special aggregations of molecules. Still less is it permissible to say that molecules feel and think (which, however, is said nowadays) because these phenomena are only manifested by special aggregations of molecules under special conditions.

22. Playing such tricks with language, and confounding the conception of Life with the conception of Existence, we may ask: Why should not a lamp-post feel and think, since it lives and is subject to molecular changes consequent on impression? Why should not a crystal calculate? Does not oxygen *yearn* for hydrogen? Has not hydrogen the property of humidity? These questions seem absurd, yet they are only naked presentations of what some philosophers have clothed in technical terms, and their readers have accepted in confidence. The

humidity of hydrogen seems to me on the same footing as the sensibility of albumen. Hydrogen is an element in water, as albumen is in nerve-tissue; and if we identify nerve-tissue with albumen in disregard of all other constituents, we may identify water with hydrogen.

Nägeli, the eminent botanist, has quite recently expounded the hypothesis of universal sentience, and his exposition we will consider here. "In the higher animals," he says, "sensation is distinctly present in the movements consequent upon irritation. We must therefore credit the lower animals with it as well, and we have no reason to deny it in the case of plants and inorganic bodies." Surely we have the very best reason to deny it when once we have fixed on the characteristic phenomena expressed by the term sensation; for if we admit that sensation is a function of its conditions, we have only to inquire whether the conditions are similar in the movements of organic and inorganic bodies; and finding the conditions markedly unlike, we conclude the phenomena called sensation in the one are not present in the other. The reason why lower animals are credited with sensation of a simple order is that their organisms resemble those of the higher animals and those of the higher animals resemble our own. In proportion to the resemblances in the organism we infer resemblances in the functions. But between crystals and organisms the dissimilarity is great and manifold; the resemblances are quite general, and such as carry with them *none* of the special conditions of vitality, consequently none of sensibility.

23. The total suppression of all consideration of

speciality in the conditions becomes conspicuous as Nägeli's argument proceeds.

"Sensation causes us to feel pleasure or displeasure. Generally speaking, the feeling of pleasure arises when our natural inclinations are gratified, and the feeling of pain when this gratification is denied. As all material phenomena are composed of the motions of molecules and elementary atoms, pleasure and pain must have their original seat in these particles; they must be caused by the manner in which these infinitesimal particles are able to respond to the attracting or repelling forces which act upon them. *Sensation, therefore, is a property of the albumen molecules;* and if we grant this in the case of albumen molecules, we must grant it likewise in the case of the molecules of all other substances." Having thus settled his basis, Nägeli proceeds to raise his superstructure. Two molecules *feel* their mutual presence as an attraction or a repulsion. Either they follow their *inclination* and approach one another, or move away from one another. "Now if the molecules possess anything which is ever so distantly related to sensation, and we cannot doubt it, since each one feels the presence, the certain condition, the peculiar forces of the other, and accordingly has the *inclination to move,* and under other circumstances really begins to move, *becomes alive, as it were,* moreover since such molecules are the elements which cause pleasure and pain, if therefore the molecules feel something which is related to sensation, this must be pleasure if they can respond to attraction and repulsion, *i.e.*, follow their inclination or disinclination. . . . The simplest organisms which we know, if I may use the expression, the molecules of chemical elements, are therefore simultaneously influenced by several qualitatively and quantitatively different sensations, which conglomerate to a total sensation of pleasure or pain. At the lowest stage of material organisation which we know (namely, chemical molecules), we find on the whole the same phenomena as we do at the highest stage, where it appears as conscious sensation. The difference is only one of gradation." *

24. Let attention first be directed to the perversions of language and consequent confusion of ideas running through this passage. A chemical molecule is called an organism; this renders it easy to conclude that since organisms are usually understood to be sentient, chemical molecules may also be sentient. Again, the psychical significance of the terms "inclination," "attraction," and "repulsion," is transferred without hesitation to physical processes which have none of the special conditions requisite for vital processes.

25. Next note the misconception that the property of a compound can be assignable to any *one* of its components. We find humidity to be a property of a combination of oxygen and hydrogen gases, and *only* of this combination; but we do not find oxygen to be humid, nor hydrogen; we find no gas to be humid. In like manner we find certain phenomena classed as vital and sentient to be manifestations of certain highly complex structures; we do not find them in structures differently con-

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* NÄGELI: *On the Limits of Natural Knowledge.* Translated in *Nature*, October 25th, 1877.

stituted, nor do we ever find them in any one of the elements which compose these structures. That is matter of experience. An intelligent gas or a sentient molecule may be reached by metaphysical deduction; it never can be presented in terms of experience and induction.

26. The speculators have two arguments ready: the one is, that a product must necessarily be contained in its factors, otherwise a number might result from an addition of zeros. On the strength of this it is urged that Sensibility must be contained in each of its components, otherwise it would not result from their composition: *ergo*, the molecules have sensibility. The illustration is fallacious. True that factors are necessary to the product; but the product of a combination of factors can never be in any one factor. Is the number ten present in each of its units? The fire, the water, the engine, the rails, are all indispensable factors in railway transport, but who will assert that railway transport is to be found in fire, water, or rails? The molecules are necessary factors in nerve-tissue; but nerve-tissue exists only in a peculiar combination of such molecules, and its properties are manifested only in particular states of such combinations.

27. Closely allied to this is the second argument: "If sensation is universal, consciousness must be universal, since the law of continuity forbids the sudden appearance of any phenomenon." By this line of argument one might maintain that not only were there "sermons in stones," but that these stones were conscious of their eloquence. Pebbles are philosophers of infinitesimal energy. By this law

of continuity it may be proved that colours, scents, sounds, loves, hates, and philosophical controversies are all present in the human ovum, nay, were present in the original protoplasm, if such there were, since they could not have sprung suddenly into existence, but must have been evolved; and they could not have been evolved from elements that were colourless, scentless, soundless, loveless, incapable of thought.[*]

And why this reliance on the Law of Continuity? That law is simply a deduction from the conception of Quantity, abstracted from Quality by mathematical artifice: it is one abstract idea of Existence irrespective of all concrete Modes of Existence. It has its uses; but note, first, that it is an ideal construction, not a real transcription; secondly, that not only is it an ideal construction, which once formed becomes a necessity of thought, although it is detached from and contradictory of real experiences; it is also in the very nature of the case only applicable to abstract Existence, and not to concrete Modes of Existence. See how these considerations nullify the application of the law to the gradations and diversities of organic phenomena. If Continuity is a necessity of thought, not less imperiously is Discontinuity a necessity of experience, given in every qualitative difference. The manifold of sense is not to be gainsaid by a speculative resolution of all diversities into gradations. Experience knows sharply-defined differences, which make gaps between things. Speculation may imagine these gaps filled, some unbroken continuity of existence linking all things. It *must* imagine this, because it cannot imagine the non-existence coming between discrete existences. The metaphysical puzzle is how to reconcile the two necessities of Continuity and Discontinuity. To postulate a homogeneous Being manifesting itself in heterogeneous Phenomena, the One Real underlying manifold Appearances, does not suffice to account for the omnipresent fact of Difference. Whence does it arise? In vain is the homogeneous said to differentiate itself; one asks: Whence the conditions of differentiation? Beside the unity of Force we must accept the diversity of opposing forces. Physics could not stir a step without its discrete atoms and opposing Forces. The atoms are infinitesimal masses: both are discrete. A single force could have no resultant and produce no change.

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[*] The reader may imagine this a caricature. It is, however, a position dogmatically assumed by Noiré: *Ursprung der Sprache*, 1877, p. 304, where he says that the functions of seeing, smelling, hearing, breathing, digesting, &c., must have been potentially present in the primary cell, and were evolved through the differentiations of that cell. Strange feats have been performed ere now by means of *potentialities!* Speaking of cells as endowed with sensations is equivalent to seeing printed books in particles of metal, because books are printed from metallic types.

All this means that the Law of Continuity is not to tyrannise over our experiences, firstly, because it has no greater validity than its opposite, the Law of Discontinuity; secondly, because its application is speculative, not empirical, relating to abstract Existence, not to concrete Modes, and as such having no reference whatever to the question of Sensibility, which is one of Modes, and to the question of classification, which is nothing if not one of Modes.

28. Turning from the metaphysical to the biological consideration, it is plain that the characteristic

phenomena observed in organisms are not observed in anorganisms; and even in cases where a superficial appearance seems to imply an identity, an investigation of the conditions shows this not to be so. The actions of a machine often resemble certain actions of an organism. But when we come to understand how both are produced, we understand how the products are really very different. We deny that a crystal has Sensibility; we deny it on the ground that crystals exhibit no more signs of Sensibility than plants exhibit signs of civilisation; and we deny it on the ground that among the conditions of Sensibility there are some positively known by us, and these are demonstrably absent from the crystal. It is in vain to say Sensibility depends on molecular change, therefore all molecular change must in some degree be sentient change; we have full evidence that it is only special kinds of molecular change that exhibit the special signs called sentient; we have as good evidence that only special aggregations of molecules are vital, and that Sensibility never appears except in living organisms, disappearing with the vital activities, as we have that banks and trades' unions are specifically human institutions.

29. On the first head, that of evidence, we must therefore pronounce against the hypothesis of Panpsychism. How about its philosophic advantages? To some minds eager for unity, and above all charmed by certain poetic vistas of a Cosmos no longer alienated from man, the hypothesis has attractions. But while its acceptance would introduce great confusion into our conceptions, and necessitate a completely new nomenclature to correspond with

the established conceptions, it would lead either to a vague mysticism enveloping all things in formless haze, or to a change of terms with no alteration in the conceptions. By speaking of the souls of the molecules we may come to talk of the molecules as men "writ small;" we may assign our controversial passions to the torrent, and our dogmatic serenities to the summer sky; we shall see volition in the magnet, and contemplative effort in morphological changes. If we escape this, and regard the life and sentience of inorganic bodies as only the lowest and simplest stage of consciousness, indistinguishable from what we now call motion except that it has an infinitesimal quantity of consciousness; and if from inorganic bodies we pass to simple organisms, from these to organisms more and more complex, the soul enlarging with each stage of evolution; well, then we are returned once more to the old point of view; the broad lines of demarcation, which our classifications fix, remain undisturbed, and all the Modes of Existence known to science are recognised as such. Into this scientific system the metaphysical conception of uniform Existence has obtruded itself and borrowed scientific terms; but the obtrusion is a confusion, not an illumination.

CHAPTER III.

THE LAWS OF SENSIBILITY.

30. THE last chapter has not only disposed of a philosophical question, it has cleared the way for an exposition of Sensibility and its laws, indispensable to the foundation of a Psychology. We are only indirectly interested in the question of animal and vegetal sentience; still more remotely in that of universal sentience. Our object is human sentience. On the physiological side Sensibility is a vital property of the organism, which in the higher organisms becomes the specialised property of the nervous tissue. While the whole of the living structure is necessary for the manifestation of any one living phenomenon, we find that as the structures become more differentiated, and their consensus more complex, properties and functions become specialised in particular tissues and organs. When once a nervous system has been evolved, it takes on the particular property of Sensibility, as the muscular system takes on that of Contractility. We then cease to speak of the sensibility of other tissues, although all tissues have in protoplasm the primary conditions of that which in nerve-tissue has become the leading characteristic.

Even within the limits of a nervous tissue we become aware of great diversities accompanying a fundamental identity. If we express that which is common to all nervous systems by the general term Sensibility, we recognise in the various differences of these systems a corresponding diversity in the manifestations; so that as we admit a different sensibility in the retina from that in the mucous membrane, a different sensibility in the auditory tract from that in the gustatory; on the same grounds we must recognise that the sensibilities of a mollusc are very different from those of a carnivore or a man. And necessarily so, since *every manifestation is a function of its conditions.* When the conditions vary the function varies. Only in so far as the conditions are uniform is the function uniform.

31. Hence it appears that our general term Sensibility, while including all that is common to organic reactions, has in each particular case to be supplemented by the particular variations which distinguish it as a Mode. The general property varies with the combinations it is dependent on. Vitality belongs to every anatomical element; the several vital functions belong only to special combinations of elements. Each cell is born, grows, develops, and dies. Yet the functions of Secretion, Respiration, Reproduction, &c., belong to special groups of organs. In the same way the function of Sight belongs to the optic organs, and not to any other part of the organism.

32. This understood, we take another step. Sensibility, as the abstract term, is a symbol, the conception of manifold concretes. It does not stand for a *res completa*—a thing to be perceived, laid hold of, measured—a vital spirit, nervous fluid, or electric current—but an *energy* manifest in various phenomena. We know it well enough, as we know the

abstractions Matter and Force, which the vulgar imagine to be *things*, objects of purely sensible perception. And as the experiences condensed in the symbol Matter are referred to an imaginary *Prima Materia*, or elementary Substance, underlying all bodies and everywhere the same—the one *continuous* something of which objects are the diverse manifestation; and Force is the imaginary Power common to all movements; so we refer all sensible phenomena to an underlying Sensibility.

When, therefore, the question is asked: Is Sensibility the same as Feeling? We, interpreting the term Feeling by one of the many special manifestations known as our states of Consciousness, or even by a generalised expression of what is common to such states, detect a latent ambiguity. It is like asking whether Force is Machinery. Or even worse than this. Sensibility stands for the objective phenomena exhibited by an organism under stimulation—or, more definitely, for the reaction of a neuro-muscular mechanism. Feeling stands for the subjective changes in ourselves. If we identify the objective and subjective phenomena as *aspects* of one and the same event, we do not get rid of the ambiguity. There is this further difficulty. Sensibility is a vital property of tissue, but Feeling is the resultant state of the *total* of co-operating sensibilities. For a subjective state there is needed a *subject*, a personality. The separated segment of an animal manifests reactions classed under Sensibility; but the whole organism is necessary for the resultant state of Feeling. If it is allowable to speak of the Feeling of a mollusc, this is only on the tacit understanding that the molluscan organism being very different from the human, any resultant of its sensibilities must likewise be very different. There may be, must be, certain characteristics common to both; there must also be certain characteristics special to the human. The savage and the savant have knowledge, and knowledge gained through sensible experiences and ideal combinations of these; but the knowledge of the one never rises to the science of the other.

33. Impossible as it must ever be to know accurately what is the quality of Feeling in organisms unlike our own, we may yet be certain that it cannot be other than unlike our own; and when we come to the reactions of inorganic bodies, the demonstrable conditions are so widely different from those known to determine the reactions of organisms, that to class the two under the same rubric would be fatal to science. In Sensibility we recognise a synthesis of three factors: Impression, Irradiation, and Co-ordination. The impression of an incident force causes a reaction even in an insentient body, changing the molecular state of the body; but here—to our apprehension at least—the process ends. The same force impressing a sentient body causes a reaction of molecular change which sets going a complete series of molecular changes, grouped into a convergent resultant, which affects the whole structure and activity of the body. Its peculiarity lies in the fact that the initiated changes result in a movement of self-conservation. The organism retracts—gets away from injurious agencies, or protrudes—tends towards the fuller assimilation of beneficial agencies. Vitality is sustained only by such movements. The organism

adapts itself to the stimuli, and thus becomes ready to respond more easily to recurrent stimuli. The alterations of its static and dynamic relations are the regrouping (co-ordination) of sensitive tremors, which also revive the tremors of previous stimulations; and the resultant is a state of Feeling—a combination of primary and secondary states, *discharged* in a Motor-impulse either as muscular incitation (contractile tremors or contractions) or incitation of other neural tremors (associated sensibilities). For—and this is characteristic—in the organism a change in one part is a change everywhere: *unus consensus, conspiratio una.*

What in physiological terms is Stimulation, Co-ordination, and Discharge, in psychological terms is Sensible Affection, Logical Grouping, and Impulse. There is, of course, an immense variety of sensible affections, though all are reduced to a common term; there is a great variety of groupings, though all are effected by one organic process; and a great variety of impulses. It is the laws, or common terms, of these we have now to consider.

34. The central nervous mass—brain and spinal cord—forms a continuous whole, uniform in composition and texture, variously related to the various organs. Since we have seen that Property depends on anatomical Structure, and Function on anatomical Connection, two important facts have to be remembered:

1°. That the structure of the great central system being in its broad features similar throughout, the chief properties of each portion of that system must be similar, its functions varying with its varying connections.

2°. That since there is this structural continuity, no one part of the system can be called into activity without at the same time—more or less—exciting the activities of all the other parts.

Hence although the organism is endowed with various sensibilities, and is ready to respond in infinitely varied reactions, incessantly stimulated as it is both by external and internal forces, its tendency always is to respond *as a whole*, that is to say, only in one way at each instant. We cannot have a vivid sensation or think a particular thought without thereby limiting and excluding a number of sentient states, each struggling to emerge and to find its discharge. We cannot have one sentient state that is not enmeshed with other sentient states, so that each wave of stimulation sets going a multitude of connected stimulations. Were it not so there would be no Experience; only a succession of isolated sensible affections.

35. In a former volume we saw the structure of the sentient mechanism to be such that Irradiation of stimulation went hand in hand with Restriction to certain paths. A sensible excitation must be irradiated, propagated from one neural element to another; but it must also be grouped, a limit to the irradiation being fixed by the definite pathways of discharge cut by previous stimulations. A sensation is a group of neural tremors, a blending of primary and secondary states. No reaction on a stimulation can be called forth without revival of residua of past stimulations. Physiology, the theory of the conditions of production, and Psychology, the theory of the relations of the products, are here in perfect agreement. The

one teaches that every reaction is that of the whole organism; the other teaches that in every sensation are involved the operations of laws commonly assigned to Thinking; and in every thought the products of sensation. Although a sensory excitation always issues in a motor impulse *somewhere*, and particular excitations tend towards particular movements, yet the neural process is subject to the variable conditions of the centre at the time, and hence the sensation or the movement consequent on any stimulation is the resultant of these conditions. There never can be the excitation of a single sensory fibre passing distinctly to a corresponding motor fibre, but always the simultaneous and successive excitation of many fibres and cells. How many are called into full activity, and how many into the incipient activity called *nascent impulse*, depends on the momentary statical condition of the system. The touch which at one moment will cause a convulsion of all the muscles, at another will cause no appreciable contraction; the sound which will shake the soul with terror, will at another moment be heard with indifference, and at another not *heard* at all.

35a. The paths through which any stimulation is irradiated depend on the *poise* of the centre. The lines of least resistance are along those portions of the central tissue which are most easily disturbed. If a handkerchief be wrapped round a highly polished ball of metal, and a similar handkerchief round a ball of wood of the same size, and both are thrust into a flame, the former may be withdrawn unsinged while the other catches fire. This is because the metal is a good conductor, and prevents, for a time, the combustion of the handkerchief; the wood, being a bad conductor, allows the handkerchief to burn. In each case the force travels along the line of least resistance. It is thus with the force of stimulation. The balance of the centre is disturbed at one point, and this disturbance is propagated as a wave of impulse which finds issues at various points, just as when one door is suddenly opened several other doors of which the locks are feeble yield to the changed pressure of the air and burst open, while *all* the doors are more or less shaken, even when the resistance of their stronger locks keeps them closed. Delicate experiments prove that even the act of breathing affects the sensibility of the retina, and, *vice versâ*, the stimulation of the retina affects the breathing. But such effects are only noticed by men of science. The effects commonly noticed are the coarser, more conspicuous changes, which obtrude themselves on our notice by their energy or their practical significance.

The irradiation and restriction of a stimulation may be illustrated in the following examples. If the palm of a sleeping man's hand be tickled by a feather, this stimulation of the median nerve, through a few filaments, is irradiated through the agency of the central nervous system as a discharge on all the muscles which close the hand, just as the touch of a single hair of the Sensitive Plant causes all its leaves to contract; but the discharge is restricted to these muscles. Now apply the feather to the back of the closed hand, and the irradiation will extend over the whole region of the radial nerve: the hand will be unclosed and the forearm extended. But if, instead of tickling the hand of a sleeping man, we tickle the hand of a man awake and unoccupied, the actions will be very different, and varying with the individual and with his varying state. The poise of his centre, asleep and awake, is not the same.

Thus it is that every sensation and every action depend on the lines of least resistance, which in turn depend on the poise of the whole system. Consider this: If the belly of a frog be gently yet rapidly tapped, the frog's heart will cease to beat: the stimulation of the vagus arresting the action of the heart. But if one of the frog's legs be pinched during the experiment, the powerful nervous impulses passing up from the leg to the nervous centre override the effect of stimulating the vagus, and the heart's action is *not* arrested. By a similar interference impressions which normally cause severe pain are unfelt because of more massive impressions elsewhere.

36. From out the infinite varieties dependent on the fluctuating conditions we disengage the first Law of Sensibility :—Every wave-impulse is irradiated and propagated *throughout* the system.

Having stated the law, we must add that, like the first Law of Motion, it is an *ideal construction*, and not a transcription of objective observation. Just as the uniform rectilinear motion never can be observed in the real world of infinite motions which deflect, accelerate, and retard each other, so there can never be an irradiation throughout the central tissue, because each wave-impulse must be arrested and deflected as it is compounded with multitudinous impulses from other sources.

Hence the second law: Every impulse is restricted, and by its restriction a group is formed.

For the experimental and analogical illustration of these principles I must refer the reader to my previous volume, "The Physical Basis of Mind."

ANÆSTHESIA, HYPERÆSTHESIA, AND PARÆSTHESIA.

37. Sensibility is the excitability of the nervous tissue as Contractility is of the muscular tissue. In both tissues Excitability is an eminently variable function of variable conditions, physiological and pathological. One nerve is normally and abnormally more easily stimulated than another, one much more easily moved than another. A certain resistance is to be overcome before the molecular equilibrium can be disturbed: that is to say, the nerve has a definite tension, representing at each instant its molecular condition. Although by no means a fixed quantity, this resistance has an average value, which gives the normal degree of excitability, and which henceforth I shall term its *level*. When it sinks below this level there is anæsthesia; when it rises above this level there is hyperæsthesia.

Such variations of level may be general or particular: that is to say, 1°, characteristic of the whole or the greater part of the nervous tissue; 2°, of only one or two parts; just as a mucous membrane may be inflamed throughout or in spots. And these general and particular variations may be individual peculiarities, inherited or acquired, and abnormal adaptations, not pathological states; being in no sense a symptom of disease, even when they are pronounced idiosyncrasies. They may also be due to temporary or permanent pathological causes. Greater excitability of one Sense of course gives a predominance to the sensations thus originated, as the greater excitability of one group of muscles affords a readier outlet for discharge. Special talents and aptitudes imply a specialisation of excitability; so do perverse and criminal tendencies. The adaptation may be the organised result of over-activity—since strength and precision grow with exercise, which makes resistance less; and thus the path of least resistance creates a healthy rise in the level, which is equivalent to hyperæsthesia, a term usually applied only to the unhealthy rise of level.

The law of Adaptation, which so many organic phenomena disclose, is operative in the production of anæsthesia, as well as of hyperæsthesia. Anomalies of Sensibility thus become normal. The organism adapts itself to great variations of cold and heat without appreciable variations in feeling, as it adapts itself to variations in other stimuli—alcohol, tobacco, spices, bright lights, &c. It also adapts itself by an increased susceptibility to stimuli—the level is so raised that slight variations are at once felt. This law of Adaptation finds another expression in the fact of the organisation of impressions, to which we will turn in the next chapter.

The fact of variation in excitability, both general and particular, we know well enough. Of its causes we know little. We know that a general rise of level creates the sense of lightness, exhilaration, and power, which, however, may pass into exaltation and fury. We know also that a general lowering of the level creates the sense of heaviness, depression, melancholy, which may pass into hypochondria and stupor. And the same is true of particular variations. We can say vaguely that such states express variations of molecular condition, for we know that imperfect nutrition, arterial relaxation or constriction, the presence of deleterious substances in the blood, over-exhaustion, &c., render the nerve-tissue inexcitable or over-excitable. Future researches will no doubt throw light on this point.

There is a third state, that of paræsthesia, or perversion of Sensibility, the conditions of which are still more obscure. It is not anæsthesia, nor is it hyperæsthesia, neither sluggish activity nor over-activity, which causes all food to have a metallic taste, all odours to have a flavour of decomposition, strange shifting of colours to dance before the eyes and blur the objects ; such abnormal effects may possibly be due to some abnormal combinations in the *neural units* which constitute sensations, or possibly to some hallucinatory influence of hyperæsthesia in another spot. At any rate, such states must be taken into account. There are moral and intellectual perversions, no less than perversions of sense : abnormal reactions due to temporary or permanent paræsthesia.

38. It is obvious at a glance how each of these alterations of level, temporary or permanent, general or particular, must enter into the effective working of the sentient machine. "Central excitement" means not only rapid and general irradiation of impulse, creating eloquence and inspiration, it also means delirium and fury. Partial hyperæsthesia or anæsthesia will produce only local disturbance and

distress: the mind is forcibly directed towards the organs whose level has been raised or lowered, thus creating unusual sensations; but so long as the brain is healthily active, such sensations are obtrusive, not delusive: they are interpreted without agitation. If, however, the excitement spreads, then the local disturbance becomes the starting-point of an agitated and irrational explanation. Worms in the intestines, which produce only discomfort in most children and adults, will produce convulsions in some children and delirium in some adults.

Let an example or two of partial rise of level be mentioned. In certain states of the auditory tract the familiar sensations of singing in the ears acquire the intensity of objective sounds. There are patients who cannot read a book without hearing the words spoken after them, as if by some outstander. In the normal state we may by close attention be distinctly conscious of faintly hearing the words we silently read, but in the abnormal state this faint sensation becomes a vivid sensation.

Schüle mentions a case of a man who had hallucinations of sight and sound only through the right eye and ear. Before the right eye appeared a black dog or a hussar in blue uniform; these vanished when the right eye closed. In the right ear sounded voices of insult and instigation. The only hallucination of hearing I ever experienced was that of a voice heard on the right side. In illustration of the possibility that hallucination may be the effect of hyperæsthesia, an experiment by Jolly is worth notice: one of his patients, suffering from singing in the ears, but without hallucination, was electrified, and instantly his "thoughts became audible to him;" after this, whenever he was electrified he had hallucinations. In another case Jolly found that the galvanic current when strong enough to produce pain caused auditory hallucination in a patient who was not suffering from acoustic hyperæsthesia. (*Archiv für Psychiatrie*, 1874, Heft iii.)

Fixed Ideas, Monomanias, Irresistible Impulses, &c., are all referable to partial hyperæsthesia. Cervantes has well imagined Don Quixote thinking and acting rationally on all subjects except Chivalry:—this group of associated ideas had such a high level of tension that it was always trembling on the brink of discharge. Deafness is partial anæsthesia—a lowering of the normal level of tension; and that is why deaf people hear better amid the noise of streets or crowded rooms, because then the general stimulation of the centres has raised the level of tension, and a slighter impulse disturbs it.

CHAPTER IV.

THE ORGANISATION OF IMPRESSIONS.

38a WHEN in an organism of simple structure a particular portion of the substance gets specialised to a particular office, that portion is an "organ" in its most rudimentary form. Instead of *any* portion of the body being indifferently applied to the prehension of food or its digestion, one particular portion is "differentiated" for prehension, another for digestion. When, instead of the whole sensitive surface responding to a stimulus, one portion of it acquires a rise of tension, it becomes so ready to respond that it takes the lead as the line of least resistance. This soon develops into a special sense-organ; and then, although the whole surface is sensitive to light and warmth, the eye becomes the special organ for light and the skin for warmth. An organ for electricity has still to be developed.

Each organ has its special structure and consequent excitability and mode of reaction. The reaction to the stimulus of a wave of air is different from that to the stimulus of a wave of ether, and the organ which is excitable by the one is not appreciably excitable by the other. A differentiation is also soon established in the organ itself. The eye becomes capable not only of originating sensations of light and darkness, but also sensations of colour: it becomes organised for red, yellow, green, blue, violet—but not for waves beyond the spectrum. There goes on a twofold process of differentiation and integration of structure, with a corresponding development of function. To say that impressions have become integrated is to say that they have become organised. Instead of indefinite irradiations, the impressions have definitely restricted pathways, and instead of a tumult there is orderliness. The impression produced by a white object is not only definite, it is further definitely connected with some other impression, so that if to the perception of whiteness be added the perception of a certain crystalline glitter, there inevitably arise all the previous experiences which determine the judgment —"sugar."

39. When the newborn infant has its eyes first assailed by light, we observe an incoherent flutter of movements very unlike the coherent succession of movements which a few weeks afterwards converge and adjust the eyes so that they fix a luminous point and follow its movements. When the infant first feels the cold air, the muscles of its body are agitated and the respiration is tumultuous. One stimulation suffices to produce a commotion throughout the nervous centres. In time this ceases: as the impressions become organised, the commotion is restricted to definite paths; and the general commotion only follows on some sudden or violent excitation. In learning to write, a boy finds it impossible to use his hand alone; he must also move his tongue, facial muscles, and perhaps his feet. These unneces-

sary discharges he learns to restrain after a while. We all, on first attempting a muscular feat, waste much superfluous energy in hampering movements which we gradually learn to subdue. It is the same in our mental acquisitions. Our knowledge becomes more and more definite and particular as the impressions become integrated into sensations, the sensations into perceptions, and the perceptions into conceptions.

40. If we reflect on the stimulations to which the organism is necessarily subjected, and remember that each stimulation leaves behind it a tremor which does not immediately subside, we shall appreciate in some degree "the excessive complexity of the mechanism, and marvel how any order is established in the chaos. What we must firmly establish in our minds is that the mechanism is essentially a *fluctuating* one, its elements being combined, recombined, and resolved under infinite variations of stimulation. If it were a mechanism of fixed relations, such as we find in machines or in the 'mechanism of the heavens,' we might conclude that certain organites have greater resistance as a consequence of their structure, just as one muscle resists being moved by the impulse which will move another. Nor is it doubtful that differences exist in nervous fibres; but the laws of central excitation are not entirely thus interpretable, since we know that the paths which were closed against an impulse of considerable energy may be all open to an impulse of feebler energy, and that a slight variation in the stimulus will often be followed by a wide irradiation. For example, a grain or two of snuff will excite the violent and complex

act of sneezing, but the nerves of the nasal cavity may be pinched, cut, or rubbed, without producing any such result. One group of nervous fibres will fail to involve the activity of neighbouring groups; and the simple movement of a single organ is then all that appreciably follows the stimulation; yet by a slight change in the stimulation the fibres are somewhat differently grouped, and the result is a complex movement of many organs. It is this fluctuation of combination in the fibres which renders education and progress possible. Those combinations which have very frequently been repeated acquire at last an automatic certainty:" * they are "organised," *i.e.*, they become instruments by which we operate.

It is scarcely needful to insist that while the process of integration was preceded by a differentiation, it also leads in turn to a fresh differentiation. The organ develops. A sensation, say of red, differentiates into many shades of redness, and combinations of reds with blues and browns. A perception of one object prepares the way for and enables us to *apperceive* slightly different objects, and its combinations with widely different objects. A conception, at first the integration in a symbol of many and various perceptions, becomes thenceforth the root out of which other conceptions grow. It is the same with words. Once formed, a sign becomes a root, from which very various words are evoked, each having its different signification.

40a. In considering the pathways of neural activity, we must remember that they are normally and abnormally established. The normal pathways are the connate dispositions of the mechanism which we inherit, and the acquired dispositions of experience: it is to these latter that the terms "organised impressions," "residua," "habits," must be applied. The acquisitions may be temporary or permanent, and in either case they may be healthy or unhealthy. They arise out of individual idiosyncrasies and incidental experience under normal conditions. They also arise out of pathological conditions. Without disease, an impression of unusual intensity may leave behind it such a disposition of structure that the feeling or the movement will be re-excited on any general excitation of the centre, as well as by its original stimulus. It is thus that nervous tics and twitches, and irresistible tricks of thought and act, are established. They are minor habits. The healthy organism exhibits this plasticity in the formation of new combinations, a plasticity which rests on differences of excitability in organs and organites due to physiological and pathological causes. In the unhealthy organism or organ this plasticity is more conspicuous, because it manifests itself in combinations that are abnormal.

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* "Physical Basis of Mind," p. 304.

RESIDUA.

41. How are we to understand these traces, these *residua*, which play so large a part in mental life? Feelings and ideas come and go, revive and disappear again, revive once more, and then perhaps are lost for years; yet in the closing hours of a long and crowded life a touch, a tone, a sight may recall the scenes and events of infancy, over which the darkness of unconsciousness has rested for so many years.

What is this darkness, what this persistence under it? According to the old psychologists, the Sensorium is a "chamber of images," a spiritual picture-gallery, preserving all the scenes and events that have passed before sense; no impression is ever lost; it may fade into twilight, or vanish in the darkness, but it keeps its place in the picture-gallery, and will be visible every time the closed shutters are reopened. This is obviously no explanation, but a metaphorical restatement of the fact observed. What calls for explanation is the contradiction of a continued persistence in consciousness when the persisting states are unconscious, and the capability these states have of suddenly, after many years, again starting into consciousness. In what sense can we admit this persistence? The conscious states disappear; the feelings as feelings no more exist after the subsidence of their excitation than the last year's roses exist. But something remains. The organism has traces of its past excitations, and their re-excitation is easy. This is not only true of conscious experiences, it is true of experiences which at the time were unconscious. Every one knows how the objects we did not observe in passing along the street may be vividly seen when afterwards we recall that passing. There are also cases on record of idiots who under acute maladies have manifested a memory of events and ideas which previously they had seemed not to notice; scarcely able to articulate a few words in their ordinary condition, they now speak fluently and eagerly of events which passed years ago. It is certain that the organism is modified by excitations; but it is not at all certain that the feelings which accompany or result from such excitations persist after the subsidence of their causes. To say that they still continue to exist in the mind is not more rational than to say that melodies continue to exist in the musical instrument after the sonorous vibrations have ceased, or that the complicated and fluent movements of a fencer continue to exist after he has laid aside the foils. By again striking the notes in the same order of succession each melody may be reproduced; by again taking up the foil the fencer may once more go through the former graceful movements; and so by stimulating the Sensorium again its reactions may be reproduced. Fifty years ago I learned to swim —learned so to co-ordinate my muscles that I could float on the water with a rhythmic movement. It is more than fifteen years since I repeated this act; yet no sooner shall I find myself once more in the water than the co-ordination of my muscles will be affected as of old. During these fifteen years there has been an absolute cessation of this particular mode of grouping the muscles; instead of this mode, the muscles have obeyed quite different modes of grouping. Yet the later modes have not effaced the earlier. What does this indicate?

The favourite hypothesis of our day is that all the modifications of the organism which are habits of thought and action, tendencies, memories, idiosyncrasies, &c., depend on the establishment of fixed dispositions in the cells and fibres of the nervous centres; this disposition is the mechanical arrangement which remains persistent when all action of the mechanisms is at rest. Another hypothesis replaces this mechanical arrangement by a chemical modification. The brain is likened to a photographer's plate on which luminous impressions are permanently fixed.

Parenthetically let us notice the fact that if a key be laid upon a sheet of white paper exposed to the sunlight, and the paper be then placed in a dark drawer, years afterwards, when the paper is again brought into the light, there will be visible on it the spectral image of the key. This may at first seem to be an illustration of Memory; the darkness of the drawer may represent the darkness of unconsciousness. But the illustration fails in this: if the paper is to retain the spectral image of the key, it must be sedulously preserved from the action of light; whereas the brain never is preserved from the stimulation of impressions, yet it is always ready to react on a repetition of stimulation.

Again, the brain cells have been credited with the power of "retaining impressions as certain bodies remain phosphorescent after exposure to light." From a metaphor this has been translated into a fact; and Memory, defined as "the retention of impressions," is "cerebral phosphorescence." But this is only a materialistic form of the spiritualistic hypothesis that the revival of past feelings is the unveiling of veiled images. Surely the simple interpretation is that past feelings are revived by repetition of some of their conditions. No one says that the silent bell is phosphorescent, that it retains the sonorous excitations; what it retains is a slightly modified molecular structure, which will sound again on being thrown into vibration.

42. A feeling is a function of its conditions.

Among these conditions are neural processes, and as these depend on the neural structure, it is obvious that any and every modification of structure will cause a corresponding modification in sensorial reaction. When a violin or horn has been played on frequently by a tyro its tone deteriorates, its molecules become rearranged, so that one mode of vibration is more ready than another. It is thus also with the brain. Its molecules are rearranged in lines of least resistance, and as these become the paths of discharge, the feelings which are their activities may be said to be stored up as *residua* in the brain.[*]

After a vast succession of stimulations, the Sensorium is so modified that it is ready to react in an immense variety of combinations, each being determined by a definite mode of stimulation, as a violin responds to definite pressures of the bow and finger. If one object in a room is set vibrating, all objects which have synchronous vibrations with this one begin also to sound, the rest remaining silent; so one excitation of the Sensorium sets going associated excitations, the associations rising out of prior modifications. Thus my dog and cat are on the hearthrug; I whistle, but while the dog at once starts up, the cat is unmoved. She, too, hears the whistle, but for her it has no such significance as for the dog; she has not been modified, as he has, by experiences which have left their traces that determine a particular reaction on the impression.

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[*] "Toute impression laisse une certaine trace ineffaçable ; c'est-à dire, que les molécules une fois arrangées autrement, où forcées de vibrer d'une autre façon, ne se remettront plus exactement dans l'état primitif. Si i'effleure la surface d'une eau tranquille avec une plume, le liquide ne reprendra plus la forme qu'il avait auparavant ; il pourra de nouveau présenter une surface tranquille, mais des molécules auront changé de place, et un œil suffisamment pénétrant y découvrirait certainement l'événement du passage de la plume. Des molécules animales dérangées ont donc acquis par là un degré plus ou moins faible d'aptitude à subir ce dérangement. Sans doute, si cette même activité extérieure ne vient plus agir de nouveau sur ces mêmes molécules elles tendront à reprendre leur mouvement naturel ; mais les choses se passeront tout autrement si elles subissent à plusieurs reprises cette même action [especially if a change of chemical composition has been effected]: dans ce cas elles perdront peu à peu la faculté de revenir à leur mouvement naturel, et s'identifieront de plus en plus avec celui qui leur est imprimé, au point qu'il leur deviendra naturel à son tour, et que plus tard, elles obéiront à la moindre cause qui les mettra en branle." DELBŒUF : *Théorie générale de la Sensibilité*, 1876, p. 60.

43. We may now understand what is meant by the *psychostatical condition:* it is the mass of the residual modifications; some permanent, constituting the organised habits and tendencies; some temporary, the evanescent changes which modify the direction of the organised tendencies, so that the same stimulus has different effects in health and in sickness, in joy and in sorrow, before dinner and after.

One important element is the influence of the viscera with their varied stimulations, each perhaps too faint or too diffusive to take its place among the discriminated feelings, none rising into the definiteness of Knowledge, yet all by their concourse determining both the directions of Thought and the motives of Action. The hypochondriac describes his visceral feelings by metaphors, and knows these to be metaphors: he says he feels "as if" an animal were eating away his inside. The insane patient transforms these metaphors into statements of fact: he believes that an animal is gnawing his inside. Even in health our appetites, desires, dominant conceptions, cause us to frame for their gratification schemes as wild and conclusions as preposterous as those which traverse the restless mind of the insane. The difference is that the sane mind has only a momentary confidence in the reality of its illusions. The poet and the madman frame fantastic combinations, but the poet is aware of the fiction, and the madman relies on it as fact. The sane man is sane only when he can control the passing suggestion by some rapid intuition of its discordance with experience—that is to say, by the revival of certain residua of former feelings.

CHAPTER V.

THE SENSORIUM.

44. We feel, think, and will. Where? Is there one organ set apart for the three functions? Are there three organs, each to some extent independent of the other, and each with its special function?

Those psychologists who rely solely on Introspection, disregarding physiological considerations, assign the three functions to a spiritual entity, the Soul. "It is this which feels, thinks, and wills. It is one and indivisible; its manifestations are various. It employs the organism as its instrument." There is much to be said for this conception, especially when the purely subjective point of view is maintained. But the necessities of research have led to the combination of the objective or physiological with the subjective or psychological point of view; and even the most resolute of spiritualists are forced to assign different sensations to different sense-organs. Gradually the physiological explanations have usurped a larger place. These sometimes assigned Feeling, Thought, and Volition to the Brain (meaning the Cerebral Hemispheres) as "the organ of the Mind;" sometimes the Brain was declared to be only the "organ" of Thought, the ganglia at the base of the Cerebrum being "the seat" of Sensation, and the organ of Volition was left somewhat indeterminate—partly belonging to the Brain in so far as Volition implies Thought, and partly to the Motor-ganglia (whatever these may be) in so far as it implies Action.

Such are the current opinions of physiologists, and the psychologists who follow them often superadd a vague and vacillating conception of a Sensorium as the "place where impressions become feelings," or as a "chamber of images" where past feelings are stored up—the great garner-house of Experience. Let us try to reduce these conflicting views to some general view which will embrace what in each of them corresponds with ascertainable fact.

45. Physiologists distribute Vitality among the general functions of Nutrition, Reproduction, Sensation, and Motion. These are subdivided into special functions—Circulation, Respiration, Digestion, Urination, Ovulation, Lactation, Locomotion, &c. Psychologists distribute Mind among the general functions of Feeling, Thinking, and Willing, with the subdivisions of Attention, Memory, Imagination, Ratiocination, Instinct, Desire, &c. A great want of precision is noticeable in both, and this defect is conspicuous when any attempt is made to assign one of these functions to its respective organ. Let us not trouble ourselves, however, with this deficiency at present, but accept the popular classifications.

One difficulty is peculiar to the psychological classification. The physiologist is able to assign certain easily recognisable organs to Circulation, Respiration, Digestion, Lactation, &c., being quite confident that no analysis will resolve the vascular system into an alimentary canal, nor prove Respiration to be a mode of Locomotion. These functions are indeed *inter*-dependent, yet each is assignable to its separate organ or apparatus. It is otherwise with the mental functions. Here we observe an inseparable unity which admits of only ideal analysis, and that vacillating. Perception cannot be separated from Sensation nor from Attention; nor can Volition be separated from Attention and Perception otherwise than by an arbitrary procedure like that which detaches Motion from moving bodies and Form from Matter. We may, indeed we must, assign separate organs for the classified sensations, and so speak of each sensation as the reaction of its special organ. But this is an analytical artifice, from which for the time all recognition of the organism as a whole is excluded.

46. Nor is this the only difficulty. We are forced to express the simplest phenomena in terms of the most complex. We cannot describe a psychical process without employing terms which connote the highest products. Discrimination, for example, is a term drawn from the intellectual sphere, yet we are forced to use it for the difference between one sensation and another, or between two degrees of the same stimulation. Memory, again, means much more than the organic process of Reinstatement; Volition more than Motor-impulse; Reason more than Grouping. But while so many terms connote more than the organic processes, many also connote less. We abstract one element from a complex whole, and having named it, make it stand for the whole. Thus Stimulation is abstracted from Reaction, and Motor-impulse from Movement: not that such isolations are really possible; but, having named the two aspects or stages

of the one process, we are apt to regard them as separable and independent.

Unless this excess and defect in our terms be borne in mind, we shall overlook the cardinal fact that there is a mutual implication in mental functions, and that this points to uniformity of process and unity of organ. Now since the organs are demonstrably many and diverse, the sought-for unity must be in their convergence and co-operation—in a word, in the organism; the *sensus* issues from the *consensus*. Common usage recognises no distinction between a sensation of colour and a perception of colour, no distinction between perceiving an object and attending to it. Psychology requires that there should be different terms; but whatever these may indicate, whatever may distinguish the act of perceiving from the act of attending, or the elements involved in a sensation from those involved in a perception, these are modal differences, since it can be shown that there is no organ of sensation which is not also an organ of perception, and an organ of attention.

47. There is, indeed, one function which may seem to stand apart, and to require a separate organ. This is the function of Thinking considered in its most special and elevated form as Conception or the operation on symbols. It seems so removed from, and so unlike all the other functions, by its detachment from sensible impressions; and, moreover, its combinations frequently follow so different an order from the order of sensations—our play of Thought being so unlike our subjection to Feeling—that a separate organ may plausibly be demanded for it. The cerebral hemispheres are generally

chosen as its organ. They are removed from or superposed upon the other nervous centres, and are superficially unlike the other centres. They are proved to operate on the lower centres, and are believed to be the seat of combination for all the senses. In them sensations are said to be transformed into thoughts, emotions into sentiments.

There is much to be said for this hypothesis, otherwise it would not have been maintained by so many eminent thinkers. But my own studies of the organism and of the functions allow me to accept it in only a very qualified form. I am led to the conclusion that Thinking is no independent function, though Conception is such, and that even when detached from all sensible impressions, and considered solely as the operation on symbols—what is called pure Thought—it stands in the same relation to Perception that Algebra stands to Arithmetic: further that the cerebral hemispheres, considered as organs, are similar in structure and properties to the other nerve-centres; that the laws of Sensibility are common to both; that the processes are alike in both; in a word, that the Brain is only one organ (a supremely important organ!) in a complex of organs, whose *united* activities are necessary for the phenomena called mental.

48. This is not the place for a physiological discussion of so large and difficult a subject. Let me only warn the reader who has to rely on secondhand instruction that the assignment of even Thinking to the cerebral hemispheres is purely hypothetical. Whatever may be the evidence on which it rests, it must still be acknowledged to be an hypothesis awaiting

verification. This may seem incredible to some readers, accustomed to expositions which do not suggest a doubt—expositions where the course of an impression is described from the sensitive surface along the sensory nerve to its ganglion, from thence to a particular spot in the Optic Thalamus (where the impression is said to become a sensation), from that spot to cells in the upper layer of the cerebral convolutions (where the sensation becomes an idea), from thence downwards to a lower layer of cells (where the idea is changed into a volitional impulse), and from thence to the motor-ganglia in the spinal cord, where it is reflected on the motor-nerves and muscles.

Nothing is wanting to the *precision* of this description. Everything is wanting to its *proof.* The reader might suppose that the course had been followed step by step, at least, as the trajectory of a cannon-ball or the path of a planet is followed; and that where actual observation is at fault, calculation is ready to fill up the gap. Yet what is the fact? It is that not a single step of this involved process has ever been observed; the description is imaginary from beginning to end. I do not say that imagination has had no inductions to work upon, but I say that all the evidence we at present have goes no nearer than showing that the integrity of the nervous system is necessary for the manifestation of its mental phenomena; and that although specialisation of function demands specialisation of organ, we have not yet discovered the special parts played by particular portions of the central nervous mass.

49. The brain is sometimes said to be the organ of the Mind, sometimes the organ of intelligence, and sometimes the Sensorium or general "place of Feeling." It cannot be the exclusive organ of the Mind if under that term we include sensations, instincts, and volitions, for—as was abundantly shown in my previous volume—various sensations, emotions, volitions, and even instincts, may be manifested *after* the brain has been removed. Now, when we reflect on the great disturbance to the general mechanism which must result from such an operation as removing the brain, and how easily a comparatively slight disturbance of a mechanism will abolish many of its manifestations, we see decisive proof that the brain can only be one factor—however important—in the production of mental manifestations.

Can it be the organ of Intelligence? I have already stated why it cannot. The popular argument respecting the parallelism of cerebral and mental development in the animal kingdom, showing more brain-mass to be accompanied by greater and more varied intelligence, breaks down on a closer examination of the evidence. It is not true that either the absolute or the relative size of the cerebrum is a constant index of mental power.* Moreover, in the numerous cases where the parallelism is observed, the increased development of the cerebrum is accompanied by a *still greater increase in other masses*, namely, the cerebellum, pons, pyramids, peduncles, and olivary bodies, which have their parts to play in the sentient mechanism; and it would be a very unphysiological procedure to assign the whole of the observed difference merely to the increase in the cerebrum, when a corresponding or greater increase in other parts of the mechanism accompanies it. Biassed by the traditional conception of the cerebrum being "the organ" of the Mind, physiologists have failed to take into account any variations in the other parts of the nervous centres. Indeed, so strong is the bias, that all the contradictory evidence is set aside. Thus emphasis is laid on the fact that idiots have small brains, whereas men of conspicuous mental powers have large brains. Were the fact constant, it would not carry the conclusion; but so far from its being constant, every instructed physiologist is aware that there are large-brained idiots and small-brained men of intelligence; and is also aware that the small-brained idiots exhibit many *other* inferiorities of structure besides that of their cerebral hemispheres.

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* M. DARESTE in his *Mémoire sur les Circonvolutions* (*Annales des Sciences Naturelles*, 1854, i. p. 102) notes that fishes of the genus *Mormyra* have cerebra more developed than reptiles, birds, or than even some mammals. The cerebrum fills the cranial cavity, and is very like that of the rodents. It has three lobes, the posterior having well-marked convolutions; the other lobes have them also, but they are only visible when the superficial layer of grey matter is removed. These lobes cover the whole of the rest of the encephalon. The cerebellum is also large. "Je ne crois pas qu'aucun naturaliste," he adds, "puisse prendre l'existence de ces circonvolutions chez les Mormyres pour l'indice d'une supériorité intellectuelle."

The advocates shift their ground to meet the opposing facts. When it is shown that their assertion of a parallelism running through the animal series does not hold—when *size* is proved not to be a constant index, *weight* is advanced; when this also fails, *relative* size and weight are relied on; when these also fail, the stress is laid on the grey matter; and when this fails, on the existence of special cells.*

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* BAILLARGER (*Académie de Médicine*, July 1856) cites the case of a child aged four years, whose brain weighed 1305 grammes—as much, if

50. As to the clinical and experimental evidence which is adduced in proof of the exclusively mental functions of the hemispheres, I shall examine this more minutely when I come to treat of *cerebration* and the part it plays in the sentient mechanism. Enough here to note that the facts adduced by various observers are mutually destructive of the various interpretations. This has been emphatically stated by Ludwig (*Physiologie*, 1858, i. pp. 607–9). But as the cases of affected intelligence due to injuries and disease of the hemispheres produce a deep impression on the uncritical reader, who fails to distinguish between the *loss* of a function following the destruction of its organ, and the *suppression* of a function following a disturbance of the mechanism occasioned by destruction of some distant organ, I will add in a note three decisive contradictions to the hypothesis of the cerebral hemispheres being the exclusive "organ" of the mental functions.[*] Were the brain the exclusive "organ of the

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not more, than the generality of adult brains. Wagner's measurements, conducted with the greatest skill, show how utterly size and weight fail to represent the mental superiority. See the remarkable paper by Prof. Turner: *The Convolutions of the Human Brain in relation to the Intelligence*, published in the *West Riding Lunatic Asylum Reports*, 1873, vol. iii. His conclusion is that the size and weight of the brain cannot *per se* be taken as index of intellectual power.

Griesinger remarks: "une chose surprenante c'est une *abondance extraordinaire de substance grise* dans le cerveau de quelques idiots; cette substance grise se trouve dans les endroits où elle existe normalment, mais son volume est extrêmement considérable et *dépasse celui de la substance blanche.*" *Maladies Mentales*, p. 420.

[*] In the *Gazette Médicale*, June 1865, Dr. Berger cites the case of a young man who had *both* anterior lobes of the cerebrum carried away by a machine accident. (These lobes, be it noted, were the favoured localities for the purely intellectual processes, until Hitzig and Ferrier disturbed the notion by assigning motor-centres to them; and the so-called organ of Language is also placed there.) Well, the man spoke, and spoke

Mind," in the same sense that the eye is "the organ of Sight," any and every injury to its structure would be manifest in a corresponding injury to its function. Could an animal see after removal of its eyes, we should conclude that the eye was not the organ of vision. Since an animal can feel, will, judge, and move after injuries to, and even after removal of, its brain, we must conclude that the brain is not the "organ" of feeling, willing, judging, and moving.

51. Nor is this conclusion disturbed by the facts which show that injuries to the brain do generally affect the mental functions. The facts of sensation and motion being suppressed or diminished in consequence of injuries to the cerebral convolutions no more prove the hemispheres to be the seat of sensation, the organ of volition, than the facts that Secretion, Respiration, and Digestion are suppressed or diminished by injuries to the cerebral convolutions prove the cerebrum to be the "organ" of Secretion, Digestion, and Respiration.

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rationally, just as before the accident; replying to all questions, and putting questions of his own. Delirium came on only during the last week of his illness.

Dr. Bigelow has the skull of a man who had an iron crowbar driven through his brain by the explosion of a mine. The crowbar entered one side, under the zygome, and came out at the opposite side, near the summit of the head; it went therefore right through the frontal lobes. Yet this man survived the accident four years with faculties inappreciably affected.

Schwarzenthal, in the *Wiener medicinische Presse*, 1871, No. 34, relates the case of a woman who had been in the hospital with low fever, headache, and depression, and was killed in a quarrel one month after quitting the hospital. She had resumed her ordinary work without manifesting diminution of either bodily or mental activity, yet the *post-mortem* disclosed the whole of the posterior half of the right hemisphere to be a mass of pus, the anterior half soft and dough-like, the left hemisphere the same, while the cerebellum was a softened mash.

All that the facts hitherto observed can be said to prove is the immense importance of the cerebral hemispheres in stimulating and regulating the action of the lower centres. If Sensibility is a property of nerve-tissue, and if the tissue of the hemispheres is in all essential respects the same as that of the whole central axis, we must no longer isolate the cerebrum from the rest of the nervous system, assigning it as the exclusive seat of sensation, nor suppose that it has laws of grouping which are not at work in the other centres.

But because I deny the legitimacy of the hypothesis which assigns the Sensorium to the hemispheres only, I must not be understood to question the *predominance* of the hemispheres in all sensorial phenomena. Both by their mass and their position this predominance is evident.

52. Having thus cleared the ground, we may attempt an answer to the question: What is to be understood by the Sensorium? Where are we to place the general centre of Feeling and Co-ordination? Objectively there is a manifest independence among the sense-organs. Certain sensations are always and exclusively consequent on the stimulation of certain organs. The eye can no more respond to a sonorous vibration than the liver can yield a secretion of milk. The suppression of one organ does not necessarily entail a loss of function in another. The blind are not deaf. Hence we say that each sensation has its seat (more accurately its origin) in its special organ. The eye sees, the ear hears, the tongue tastes. Had we only the objective interpretation to guide us, this would be the irresistible conclusion.

53. But on turning to the subjective interpretation,

we see grounds for qualifying this statement. The first point which presents itself is the unity of Feeling. We express this in the familiar aphorism, "It is not the eye, but the mind which sees;" and physiologists soon learn that it is not the organ, but the *organism by means of the organ*, which reacts as sensations on the stimulus of light. The special organ is an indispensable condition in determining the specific quality of the sentient affection, but it is only one among several conditions, and *its* particular product is not the fact of Sentience, but the *direction* of the sentient changes. That is to say, without the optical apparatus no ethereal stimulus would produce sensations of light and colour, for these affections are determined by the structure of the recipient apparatus; but stimulus and apparatus, though indispensable conditions, do not suffice: there is still needed the final and complementary process of sensorial reaction. The proof of its being in this final process that impression becomes sensation is, that after the Sensorium has been affected by optical stimulations, and the reactions "organised" there in the form of sensations of light and colour and perceptions of visible objects, these reactions, *i.e.*, sensations and perceptions, may be reproduced when the optical organ is *not* directly stimulated, nay, even after it has been destroyed. We call up visual images by association, and such images sometimes acquire the energy of actual sensations; even the blind, if they have once seen, are capable of visual hallucinations. The fact of hallucination is decisive against placing the sensation in the sense-organ, for it not only occurs when the organ is absent, but occurs in spite of the organ being directly stimulated. We have the visionary sensation of an object suppressing the actual sensations which objective stimuli would originate: instead of seeing the carpet or the wall on which the eyes rest, we see a flaming house or a crowd of rats. To these familiar facts may be added the surprising and unfamiliar fact that in some persons stimulation of the auditory organ, besides causing the reaction of *sounds,* will simultaneously cause the reaction of *colours.** Now the central distribution of the optic nerve is not that of the auditory nerve; hence both must have their action united in a common centre. And so, indeed, must all the sensory nerves. Every visual perception involves other than optical sensations: it involves touches and muscular sensations, combined with those integrations of Experience, Space, Time, Substance, Cause, &c. The image now present recalls previous images; what is *sensuously* seen is *ideally* touched, tasted, smelt, heard. But since the organ of sight is not the organ of touch, taste, smell, or hearing, it cannot be the organ in which the visible object is perceived.

This has led many writers to assume an organ of Perception superadded to the organs of Sensation; and the Cerebrum is the organ usually selected for it. But surely there is the same difficulty in clearly conceiving how the brain, if not itself the seat of Sensation, can feel what takes place in the organs of sense, as in conceiving how one man can feel what takes place inside another. If the Sensations have their seat in the sense organs apart from the brain, then the co-operation of the brain is only needed for the connecting of one sense-organ with another: it is thus dethroned, and is no longer the Sensorium, but a go-between.

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* See Problem III. for curious examples.

54. Let us try to find a reconciling point of view. We start from the fact of the independence of the sense-organs, and the speciality of their reactions. Objectively a sensation is the action of a sense-organ. We have to reconcile this with the subjective fact. Aristotle in his *Problems,* noticing the hypothesis by which Anaxagoras accounted for our hearing sounds more distinctly at night than during the day, declares the true cause to lie in the absence of all other sensations which during the day absorb so much attention; and he adds that when Sense is active apart from Intellect its action is insensible; whence the proverb, "It is the Mind which sees and hears." * This separation of Sense from Mind being purely analytical, the question arises: What do they respectively indicate?

"Sensation proper," according to Hamilton, "viewed on the one side, is a passive affection of the organism; but viewed on the other, it is an active apperception of the mind of that affection." That is to say the difference is not real, but solely a different point of view. "And," he continues, "as the former only exists for us (meaning for Consciousness) inasmuch as it is perceived by us, and is only perceived by us inasmuch as it is apprehended in an active concentration, discrimination, judgment of the mind; the latter, an act of intelligence, is to be viewed as the principal factor in the percipient process even in its lower forms, that of sensation proper." *

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* χωρισθεῖσα δ' αἴσθησις διανοίας καθάπερ ἀναίσθητον πόνον ἔχει ὥσπερ εἴρηται τό· νοῦς ὁρᾳ καὶ νοῦς ἀκούει. Prob. xi. 33. HUMBOLDT explains the fact of our hearing better at night as due to variations in the state of the atmosphere caused by the heat during the day, which occasions reflexions of the sound-waves and tends to diminish their intensity in any one direction. But although this may be a special condition, the general condition is rightly stated by Aristotle, namely, that in the absence of various solicitations any one sensory stimulus will be felt more vividly.

Accepting the analytical distinction, we may say that Sense represents the primary stage of Stimulation, and Mind the secondary and completing stage of Reaction; by a further extension, Sense comes to be the abstract of all the concrete facts of *sensible affection*, Mind the abstract of all the concrete facts of *sensible co-ordination.* Although there can be no sensible affection, pure and simple, free from grouping, no reception of impressions free from reaction, yet the need for classifying by dominant characters leads us to consider the passive aspect of a process apart from its active aspect. Hence we speak of the receptive part of the mechanism as that of Sense, although we know that unless the impressions are integrated in the central part of the mechanism nothing properly called sensation results.

55. Ordinary language is correct when it says, "We see *with* our eyes, touch *with* our hands," and so on. The language of physiologists is less exact when it speaks of the various sensations having their seats in their respective sense-organs. Not that the physiologists mean this to be understood literally. What is it they do mean? They find certain conditions common to all sensations. First, there is a sensory nerve responsive to a particular order of stimuli. This, however, is not enough; for if the

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* *Edition of Reid's Works*, p. 881.

nerve is separated from its centre no stimulation produces sensation; hence the conclusion that the centre is the seat of sensation. This conclusion is, however, qualified by the discovery that just as the nerve isolated from its centre is insensible, so also is the centre isolated from the rest of the system. The final conclusion then is, that the sensory nerve is the indispensable *primary condition* — that which determines by its stimulation the peculiar kind of reaction; the centre to which that nerve goes is the *second condition*, *i.e.*, that of reaction; the centre, thus integrally one with its nerve, is in turn integrally one with the rest of the organism, and this is the *final condition* necessary to the transformation of an impression into a sensation.

Thus physiology concurs with Common Sense in affirming that it is *we* who feel, *we* who think and will; not the brain, not any single organ, but the whole living organism. Yet the language, and often the express teaching, of physiologists is somewhat at variance with this, relying too much on analytical distinctions, and forgetting their artificial nature. What is to be understood by the *we?* It may signify the general function of the organism manifesting itself through the special functions of particular organs. In this meaning it is another aspect of Life. Or it may signify a particular group of vital functions—the sentient-motor group. In neither case does it stand for the function of a single organ; and for this reason: no single organ has a function at all when isolated from the organism.

56. The brain cannot therefore represent the *we*. It cannot be the Sensorium, but only an important

part of the Sensorium. It cannot, because it is a single organ, and its function may be abolished without destruction of other functions—the brainless animal still lives, feels, co-ordinates its sensations and its movements, not, indeed, so variously as when in the possession of its brain, yet with sufficient energy to disprove the notion that the brain is the seat of all sensation and volition. The brain is simply one element in a complex mechanism, each element of which is a component of the Sensorium, or Sentient Ego. We may consider the several elements as forming a plexus of sensibilities, the solidarity of which is such that while each may separately be stimulated in a particular way, no one of them can be active without involving the activity of all the others.

The Sensorium, being a plexus of sensibilities, is of course differently compounded in different organisms, and even in different states of the same organism. An animal without eyes is not only insensible to the special stimulations of colour, but, in consequence of this, its sensorial states have a different composition from those of an animal which has eyes. The frightened squirrel runs from branch to branch; it cannot fly from branch to branch like a bird. Its reactions are different. The man who has been shaken by some calamity cannot behold the scene where it occurred with the same feelings, is not affected in the same way as another man in beholding the same spot. The mind which has certain organised impressions, intuitions, beliefs, interprets objective phenomena by these, reacts on the impressions differently from a man who has other organised impressions, intuitions, beliefs. The sentient mechanism has been often compared with a piano, which responds by particular tones and chords when particular keys and groups of keys are struck. But the comparison fails in an essential point. The keys respond only to the player's hand, each as it is struck; whereas the Sensorium responds by a variety of nascent feelings when any one sensory nerve is stimulated. A man who has taken santonine will see yellow colours where no yellow rays are present; a dog that sees an impending blow will cry out though untouched; a man who has eaten haschish may hear a fife, and this sound will raise within him sensations as of a vast orchestra accompanied by vivid images of dancing girls. That is to say, the excitation of one sensorial reaction is the excitation of many and various reactions. In consequence of this, we not only acquire the special modifications called *habits*, we also acquire the *habits of not yielding to our habits*, when a vision of injurious effects has been connected with the actions. This is our free will.

Coupled with the fact that particular sense-organs determine by their reaction particular directions of Sensibility, and give to each sensation its individual character, is the fact that no reaction of a sense-organ is a sensation unless compounded with the reaction of the Sensorium or general seat of Sensibility. This means that a sensation is a change in the sentient organism, and not simply a change in any one organ. Hence two hypotheses are open to us. We may view the Sensorium as a single organ, or portion of the central nervous system—say the brain—structurally and functionally detached from the several sense-organs, to which all the subordinate centres transmit their individual excitations, these being by it combined into a resultant. Or we may view it as the plexus of central terminations of the sensory nerves, the *solidarity of which involves its unity of reaction under every variety of excitation.* On a first glance there appears but a slight difference between these views. Slight as it may appear, it will be found to have immense significance, for it involves the question whether the analytical or the synthetical explanation is the true one.

57. The analytical explanation has been the one usually adopted. The desire to localise the phenomena in particular organs has led to the localisation in particular portions of an organ. After the cerebrum had once been fixed upon, it was soon decomposed into grey and white substances, each with its special attribute. Reid thought they were positive and negative, and compared them to oxygen and hydrogen. Haller thought the white substance was the origin of Sensation and motion (*Elementa Physiologiæ*, iv. 392). Willis thought the grey substance was the origin of the animal spirits, while the white substance conducted (*Anat. Cerebri*, p. 93): an idea still current under slightly different expression. Gall thought the grey substance was the nutritive origin of nerve-force; and his successors have likened it to the galvanic battery, the white substance to the conducting wires.

Other attempts at localisation may be mentioned. Descartes placed the Sensorium in the pineal gland (which, by the way, modern research discovers to be not even a nervous structure); Willis assigned it to the whole encephalon, but distributed Perception to the *corpora striata*, Imagination to the *corpus callosum*, and Memory to the convolutions. Piccolhomini plausibly suggested the *medulla oblongata*, because it was the point of reunion of all the nerves of sense. Bartholinus and Sylvius, regarding the brain as a prolongation of the spinal cord, said the grey matter was the seat of sensation, the white that of movement.* Kenelm Digby, on quite fanciful grounds, placed the Sensorium in the *septum lucidum;* Lancisi, Bontekoë, and Laponerage in the *corpus callosum;* Hofmann in the *medulla* and Sömmering in the walls of the fourth ventricle.

Such notions excite a smile nowadays, and that, too, in men who see nothing absurd in assigning Thought to the grey matter of the cerebral convolutions, or even to certain cells in that matter, denying it to similar grey matter and similar cells found in other parts of the nervous tissue. Of all the attempts at localising the Sensorium, that of Prochaska is the least unphysiological. Assuming that the Sensorium must be co-extensive with the origin or termination of all the nerves, he declared this to be the whole of the central nervous system *minus* the cerebral hemispheres. The hemispheres were excluded in obedience to the classic doctrine of Thought being essentially distinct from Feeling, the hemispheres alone having the function of Thought. According to this hypothesis, the operations of the cerebrum only become conscious states when reflected downwards on the lower centres—the Sensorium.

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* Willis: *De Anima Brutorum*, 1672, p. 76; Piccolhomini: *Anatomicæ Prælectiones*, 1586, p. 269; Sylvius: *Opera*, § 7.

Dr. Todd, Dr. Carpenter, Luys, and some others, propose a modification of Prochaska's view, limiting Consciousness or Feeling to the basal ganglia. I think that of Prochaska preferable; but I should include the cerebral hemisphere and the whole of the central axis in the same plexus, because anatomical and physiological evidence converge to show that cerebrum, medulla, and spinal cord are purely topographical distinctions in the one continuous central axis, having in common the same general substance, the same general structure, the same general properties, and the same laws of excitation and reflexion.

58. It is on this ground that I define the Sensorium "a plexus of sensibilities"—in other words, "the sum of the conditions requisite for the production of Sentience." If we adopt the convenient artifice which assigns Sensibility to the neuromuscular System, with only a tacit implication of the rest of the living organism, we may also assign to the peripheral portions of the system the office of Stimulation, and to the central portions the office of Reaction. This, however, must be accompanied by the understood recognition that nerves and centres together form one system, stimulation and reaction together form one function. If we separate them, it is for the convenience of exposition. To forget this is to render inexplicable the power of the Mind over the Body. The fact thus expressed is undisputed. Its explanation becomes a puzzle when the Mind is ideally separated from the Body, and conceived to be an Existent *sui generis* which is supposed to operate on the Body. To the physiologist there need be no

more mystery in this influence of Mind than in any other vital phenomenon; the excitation of movement consequent on sensation being to him an ultimate fact. When, therefore, we reduce the abstract term Mind to its concretes, namely, states of the sentient mechanism, the "power of the Mind" simply means the stimulative and regulative processes which ensue on sentient excitation.

59. We may now formulate a conclusion: Sensibility is the special property of the nervous tissue. Every bit of that tissue is sensitive in so far that it is capable of entering as a *sensible component* into a group, the *resultant* of which is a *feeling*—*i.e.*, a change in the state of the sentient organism.

The *Sensorium is the whole which reacts on the stimulation of any particular portion of that whole.* That is to say, when the mechanism is stimulated by the agency of a peripheral nerve, this reacting-mechanism is the seat of Sentience, representing as it does the whole of the system not engaged in the (ideally) different process of stimulation.

In like manner when the stimulation proceeds from some central portion, say the central convolutions, the Sensorium then is the whole of the central mass engaged in reacting.

We are thus to understand that the Sensorium does not mean any one fixed and defined organ or portion of the central mass, but the ideal conception of a *movable centre.* It is the organism conceived as reacting on the stimulations of its organs. Any one feeling is an attitude of the organism. This attitude depends on the conditions then and there operating: it is the resultant of complex components—present stimulations blended with revivals of past stimulation. Every impression from an external source gives its particular direction ; this is either met by some counter-direction, and is arrested, or is blended with others into a group. The final issue is the attitude of the organism. The attitude represents the particular feeling, the organism represents the *We*.

The sense in which the Sensorium is properly said to be a "chamber of images"—a store-house of experience—will be considered in the next chapter.

CHAPTER VI.

THE INNER LIFE.

60. WHETHER we place the Sensorium in a single organ, or in a plexus of all nerves and centres, is quite immaterial in respect of the main psychological fact, namely, the essential *unity* of all the processes in that Sensorium, and of the laws which determine all psychical activity. Why do I insist on this fact? Does any one dispute it? No one openly disputes it, but most psychologists implicitly deny it, for they maintain Thought to be *sui generis*, unallied with Feeling; or, if in some mysterious way allied with it, yet solely determined by laws peculiar to itself, not operative in Feeling: the processes take place in an *entity* which is apart from the organism, or in an *organ* which is not fundamentally similar to other organs. The conception of the Sensorium expounded in the last chapter implies that only in virtue of an organ being an integral part of a system has it any function at all. However the needs of Analysis may split up that system into a variety of organs, a true theory must correct and complete this procedure by restoring the real significance of the organism, and its unity under variety. If, as Wordsworth says, the attempt is vain

> To parcel out
> The intellect by geometric rules,
> Split like a province into round and square,"

equally vain must be the attempt to separate Feeling and its laws from Thought and its laws. Mind is a *system*, every element in which is dependent on all the rest. It is the function of an organism, every part of which is dependent for its value on all the rest. Some readers may, perhaps, complain of the reiterated statement that it is not the brain which feels and thinks, but the man; they may declare it to be an admitted truth. But there are many truths which cease to be appreciated because they are never disputed, as there are moral and religious precepts which are never enforced in practice because they are never contradicted in profession. Had this truth respecting the organism been generally insisted on, instead of quietly passed over as unquestioned, there could hardly have arisen the belief in the reality of the artificial distinctions which assign Feeling, Thinking, and Willing to distinct agents. The unity of mental life, so emphatically proclaimed, would have been recognised as implying a corresponding unity of organ, and uniformity of organic process.

61. But the insistence on unity does not invalidate the utility of the artificial distinctions. The convenience of exposition leads us to adopt another course than was necessary for search: in the latter we are forced to take into account the whole of the ascertainable conditions of the organism and its medium; in the former we abstract from these a special group, and consider it for itself. We thus separate the Nervous System from all the other systems; the Sensorium from the Sense-organ; Sensation from Emotion; and both from Cognition.

62. The activities of the Sensorium are what is called the Inner Life. It is here the "materials furnished by Sense"—*i.e.*, the stimulations arising from the contact of the organism with its medium—are modified, integrated, recombined, fashioned into compound products, and their motor-impulses grouped into motors, motives, aptitudes. Every such modification and grouping is effected by the reaction of the system in its temporary condition; which is the state of the Sensorium resulting from, 1°, all the nutritive activity *for the time being* in the organic tissue, rendering it *ready to act;* 2°, all the *residual* effects of experience; 3°, all the *neural* processes *still in action* from past stimulations. Every fresh incident force which disturbs this balance of forces has a resultant sensation, emotion, or idea; the resultant being, of course, determined by those components.

The Inner Life thus represents the whole of our Experience. Developing with the evolution of Experience, it becomes a Logical and Co-ordinating System which enlarges perception and regulates action, rendering us more and more independent of the immediate stimulus, more and more masters of the external. It controls and directs organs which otherwise are moved only by their corresponding nerves, and only in direct reflex on impressions. It modifies, annuls, or magnifies the effect of an impression; so that at one moment we are undisturbed by the roar of the crowded streets, at another are distressed by the buzzing of a fly. Through it all feelings are capable of revival even in the absence of their original stimuli: and this revival makes *pre*-perception a factor in perception; recognition a factor in cognition. Varying the dictum of Tennyson's Ulysses—

> "I am a part of all that I have met"—

we may say with equal truth, though not with equal rhythm, "I am the product of all that I have felt." If we understand that not a sunbeam falls upon a garden wall but the wall is altered by that beam; much more is it comprehensible that not a thrill passes through the body but our Sensorium is altered by it. The alteration may be evanescent and inappreciable, or it may persist in a more or less appreciable modification. To have once had a headache is to be so far modified that we can sympathise with the ache felt by some one else. The morbid feeling which arises with a congested liver, and passes away with the cessation of the congestion, nevertheless leaves its trace: the sufferer has an enlarged experience; and sometimes the trace is so profound that the melancholy disposition remains long after the liver has become healthy, just as images of danger recur long after we are in safety. The exaggerated irritation resulting from some impression will often persist long after the occasion; a fit of anger or a shock of grief, which in a healthy organism passes away, will in one that is unhealthy and irritable establish itself as a permanent modification, and by repetition engender a chronic irritation which may pass into insanity. The sum of such traces is the Inner Life.

CHAPTER VII.

THE INNER LIFE A SYSTEM.

63. A MACHINE is a system of forces. The motor-powers are all contained within it, involved in its structural adaptations, though called out by some external impulse. A steam-engine has its motor-powers called into activity by the expansion of steam, and this is caused by the heat of the fire. A mill grinds corn when water falls upon a wheel and sets it in motion. An organism is also a system of forces called into activity by an impulse from without. It differs from all machines in two important respects: first, that its motor-powers are more remotely and indirectly connected with external impulses, and obey the direction of some impulse *within* the system; secondly, that its mechanism, or structural adaptation, becomes *modified*, and consequently its motors rearranged, under varying stimulations, so that its reactions are not uniformly the same. The organism has a history, and is the expression of experiences. On these two points of difference rests the marked contrast between the spontaneity of organisms and the fatality of machines. No machine is educable. All its actions may be predicted. What it does to-day it will do to-morrow, and without variation in the way of doing it.

Carrying out this idea of the innerness and variability of the motor-powers in an organism, both of which result from the residues of past excitations mingling with every fresh excitation from without, we may further distinguish Mind from Life, and Experience from the sentient Mechanism, by the same criterion. The living organism is built up of materials drawn from without, its forces are all set primarily going by external forces; but as a *system* it is a segregation of materials and forces, and its structure and actions are not the same as those of any external body. The materials are recombined; the forces are recombined, and follow an order of their own. If the combined actions of the steam-engine are, unlike the actions of any external forces, differently combined, still more so are the combined actions of the vital mechanism. Mind, again, is a system still more removed from the order of external actions; and in its evolution we trace an increasing predominance of this character of *innerness*, the combination and recombination of impressions into experiences, and of experiences into groups, which in turn become the elements of higher groups. Experiences become organised as Instincts, and generalised as Knowledge; Knowledge itself, in its highest stages, becomes organised as Intuitions and Logical Forms, which have the facility and necessity of Instinct. Intuitions and Logical Forms thus become to further Experience what the Mechanism is to Sentience. The rules of logic are modes of apprehension: what functions are to actions and structure is to function, that are the laws of thinking to thoughts; not *à priori*, antecedent and independent of the acts, but immanent in them, and ideally abstracted from them. When once a set of experiences has been organised, it becomes a mode of reaction by which other experiences are apprehended.

64. The organism is a system of forces; Experience is a system of feelings. Only as each impression derived from without is taken up, assimilated, and finds its place in this system, does it become an element of Experience; but once fixed there, it is a condition which determines the assimilation of others. Many impressions pass unperceived, many more leave no residue beyond that of an inappreciable modification of structure which renders the mechanism more apt to respond to similar impressions. The eye guides the hand, the ear the vocal organs, in virtue of the residues left by each in the Sensorium: these blended residues form perceptions and intuitions, so that the hand irresistibly follows the leading of the eye. Thus:—We see an object within reach. What does this mean? It means that the mind judges that a certain movement of the hand guided by the eye will touch that object: the position of the object in space is determined for us by previous organisation of visual and tactual impressions; this has now become an intuition, an instinctive judgment, so that a shock of surprise is felt if on stretching forth the hand in this direction the object is not reached. That this explanation is correct may be demonstrated by abnormal experiences. If, for example, the motor-nerves of the eye be injured, the line of vision is diverted, and the hand following this misdirection of the eye passes *beside* the object. The object is not then touchable where it is seen.

Von Græfe's paralytic stone-breaker could not at first avoid hitting his hand when aiming at the stone; but he soon learned to direct his movements according to the new visual impressions. Helmholtz gives as an illustration the effect of wearing prismatic spectacles: when we look through a pair of such glasses with surfaces converging to the right, all objects appear as if shifted to the right; and if, on first wearing them, we stretch forward the hand to grasp an object which we see through them, but take care to close the eyes before the hand itself comes into the field of vision, the hand passes to the right of the object. If, however, we keep the hand as well in sight, we find no difficulty in guiding it to the object. After a short practice we learn to touch the object even without seeing the hand. Such cases show that not only do we bring to each impression a Mechanism ready to respond, and an Experience of organised intuitions ready to interpret the impressions when these are normal, but also to correct them and readjust itself to them when they are abnormal. It is thus we recognise an illusion of Sense or Judgment; we detect its want of *congruity* with the system of experiences: it is not *assimilable.* There is a process of *Orientation* incessantly going on both in the sphere of Sense and in the sphere of Thought. When we are in doubt, oscillating between conflicting evidences and thus withheld from a convergent conclusion, we fall back upon some organised experience—some traditional belief, or some verified conclusion. The immense advantage of scientific culture is that it is a systematisation of the exact and verified experiences of all investigators, and has thus a store of trustworthy conclusions on which we can fall back when in doubt. It enables us, not indeed to doubt the evidence of our senses, but to doubt any *inference* from that evidence which is contradictory of the far wider evidence registered in scientific truths. The question is one of interpretation, not of directly sensible evidence. To the untrained mind the sensible evidence of a miracle is enough: it finds its place in the system of knowledge, as one among other marvels. To the trained mind no such uncontrolled evidence would suffice in opposition to a law of Nature which expressed manifold, uncontradicted, and verified observations.

65. It thus appears that the organism being a system of forces which is incessantly undergoing modifications, each change being the preparation for succeeding changes, each experience being assimilated by the residues of former experience, we must understand that our familiar distinctions, even when they are so broad as that of Sense and Thought, are abstractions, not real distinctions. Sensation pure and simple is no more a mental fact than Form without substance is a physical fact. Sensation is one of the many Modes of sentient Reaction, which artificially we consider apart and contrast it with Thought, another Mode of Reaction. But in both cases it is the one Sensorium which reacts, and which reacts in processes generically alike.

CHAPTER VIII.

THE RANGE OF THE INNER LIFE.

66. THE unity of the Sensorium and uniformity of its processes, while in noway excluding the diversity of Modes of Reaction and the individual peculiarity of states, is a necessary conception in a scientific treatment of Psychology. We must go further, and not only reject the current notions of Thought and Sensation being products of processes in different organs, but also reject the current notion that Reflex Action is a purely mechanical, physical process, not a physiological and sentient process. Reflex Action is involved in all sensorial reactions, and on this ground comes within the range of Psychology, which is the science of the facts of Sentience; when excluded from Psychology, it is on grounds that would equally exclude automatic and instinctive actions and many of the highest intellectual operations. One writer after another is found maintaining that instinctive and automatic actions lose their psychical character—if they once had it—and become purely mechanical. "Mechanical," I admit, in the sense in which such a term can be lawfully applied to an organism; but "purely mechanical," as excluding Sentience, I deny.

67. The question is too important to be passed over. The more so since even Mr. Spencer, who has

in many luminous pages expressed the rational view of the evolution of Mind, is not always free from the traditional view, but occasionally lends it his authority. Of reflex action he says: "Mostly it would be considered as a misuse of words to call it psychical. So that, while as belonging to the order of vital changes which in their higher complications we dignify as psychical, it may be convenient to classify it as psychical; yet it must be admitted that in position it is transitional" (*Psychology*, i. 428). I urge no objection to its transitional position, so long as its sentient nature is admitted. He seems to exclude it because of its unconsciousness: "The proximity of reflex actions to the physical life is implied by their unconsciousness." But Consciousness cannot be regarded as the *differentia* of psychical actions, first, because mental operations are often unconscious; secondly, because reflex actions are often conscious actions: we often think without consciousness of our thinking, and we often swallow, breathe, or scream consciously. Moreover the laws of neural propagation contradict the notion of there being a graduated ascent from the physical to the psychical in the ascent from reflex to voluntary actions. They contradict the notion that in a reflex there is merely the bodily connection of nerve, ganglion, and muscle; whereas in the voluntary there is a spiritual connexion of the Sensorium with nerve, ganglion, and muscle. Anatomy disproves the fiction of a "nervous arc" constituted by a sensory fibre, a ganglion cell, and a motor-fibre as capable of independent activity, without at the same time affecting the continuous central mass of which it is one element.

68. To recognise the difference between the resultant which has an escort of nascent feelings, and is known as a conscious or a voluntary act, and the resultant which has no such escort, or another escort, and is known as an unconscious or an involuntary act, is not to obliterate the fundamental uniformity in the processes by which both are effected. We may distinguish the reflex from the automatic, the instinctive from the intelligent act; but we must not forget that both belong to the vital organism, both are effected by the sentient mechanism of that organism.

Consider this striking illustration advanced by Mr. Spencer: "The rapid alternations of a centipede's leg or a fly's wing are probably as automatic as are those of a steam-engine piston; and may be co-ordinated after a generally analogous manner. Just as in the steam-engine the arrival of the piston at a certain point is necessarily accompanied by the opening of the valve serving to admit the steam which will drive the piston in the reverse direction; so in one of these rhythmically moving organs the performance of each motion ends in bringing the organ into a position in which the stimulus to an opposite motion acts upon it." Nothing can be better than this illustration of the mechanical relations in the organic mechanism. But admitting their presence, we have still to take into account the conditions under which these mechanical relations come into play. Along with the "general analogy" of relations between the steam-engine and the organism there is an important group of particular differences; and chief among these, that the steam-engine has the expansion of steam for its motor, the organism has a neural process for its motor. Now this neural process in the reflex action of the insect belongs to the same class of forces as that which we believe to be operative in the conscious actions of a man. It is on this assumption that animals are believed to be sentient organisms; and if any one refuses to grant the assumption, we may still refer to the reflex and conscious actions of our own organism, to which the same line of argument will apply. No doubt our actions have "mechanical principles;" I only insist that they are the actions of sentient mechanisms; I am as fully persuaded that *all* our intellectual operations have mechanical principles, both when accompanied by Consciousness and when not, as that our reflex and automatic actions are mechanically determined.

Nor, in spite of many ambiguous sentences, can Mr. Spencer be charged with oversight of this, for at the conclusion of his survey he makes this explicit avowal: "But although from all points of view Reflex Action is seen to be a species of change very little removed from the physical changes constituting vegetative life; yet even in it we discern *a fulfilment of the primordial conditions to consciousness.* In the lowest conceivable type of consciousness—that produced by the alternation of two states—there are involved the relations constituting the form of all thought. And such an alternation of two states is just that which occurs in the ganglion (?) connected with one of these rhythmically moving organs."

69. It is further to be noted that much of the plausibility of the argument which removes Reflex actions from the sphere of Sentience rests on the

artificial isolation of a single process from the total of processes in which it is an element. By isolating the "nervous arc" from the nervous system, and considering the reflex act apart from its preceding and succeeding neural states, it appears as a physical process. We have only to restore the omitted elements to recognise that a reflex act is a sentient act, because all its conditions are those of a sentient mechanism.

Reflexes are not only due to sensorial changes, but they leave behind them sensorial residues; they thus count among the motors of the Inner Life. In the region of the Intellect they help to form intuitions, and the greatest of all our possessions, Language. If for the most part they lie outside the sphere of Consciousness, though always capable of entering into it, they are in this respect like the Systemic Sensations, Instincts, and Emotions which constitute our Affective sphere. They form a vague mass of feelings which blend with and direct our perceptions and reasonings, and which as the chief motors of our conduct ought to have received a larger attention from psychologists than has hitherto been awarded them.

70. One great cause of the backward state of our science is the almost exclusive attention to the intellectual operations, and to those sensations which seemed most manifestly involved in such operations. It is to the mental pathologists we must turn for a more rational procedure. They have found themselves *forced* to study the obscurer, but more massive, influences of the Systemic sensations. They have been forced to recognise that Insanity is not primarily a disturbance of the Intellect; that mental

aberration and ruin are causally connected with obscure bodily disturbances; that hypochondria has its origin in an alteration of the level of excitability, now in the alimentary canal, and now in the precordial region; that the "ambitious-mania" which seems so entirely a logical perversion is allied with atrophy of the muscular system; that other manias have their sources in maladies of the heart, or of the ovaries.* Familiar experience tells how a congested liver, a filling gland, a palpitating heart, &c., will give a particular colour and direction to our thoughts; how chronic maladies may give rise to hallucinations, preposterous schemes, and irrational theories. And a glance at the psychology of animals suffices to convince us that in them at least the most massive and varied impulses must proceed from appetites, systemic sensations, and emotions, more than from stimulations of the special senses. The restlessness which the hungry animal manifests may receive its final direction from the sight or scent of its food, but the persistent impulse comes from its viscera. The sexual instinct, the migratory instinct, the aggressive instinct, the social instinct may, indeed, "act blindly," if by that is meant that the animal has no distinct prevision of distant consequences; but they are sensorial processes of the same logical order as those which determine intelligent acts. The difference is this: in the intelligent act there is interposed between the primary stimulation and the final response an excitation of residues of a wider experience; the stimulation rouses its retinue of nascent feelings sometimes as auxiliaries, sometimes as checks, and among these are often

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* "On trouvera souvent des lésions de l'utérus, du cœur, de l'estomac, des organes des sens, &c., auxquelles on peut rattacher les troubles intellectuelles, et qui sans cet examen auraient passé complétement inaperçues." VOISIN: *Leçons Cliniques sur les Maladies Mentales*, 1876, p. 16. Why in these cases would they have escaped observation? Because of the traditional notion that the Brain is the "organ" of the Mind, and consequently disturbance of mental function is only sought in some lesion of the Brain. Had the organism taken the place of this one organ, no such mistake could have occurred. Comp. *Zeitschrift für Psychiatrie* 1874, pp. 635, 678. GRIESINGER: *Maladies Mentales*, pp. 139, 148. SCHÜLE: *Geisteskrankheiten*, 1878, pp. 298, 353. Dr. LANGDON BROWN, generalising his large experience, declares Idiocy and Imbecility "not to be diseases of the nervous system only, but diseases involving almost every organ of the body." See *Remarks on the Correlation of Physical and Mental Conditions* in the *Odontological Society's Transactions*, iv. No. 1.

> "General truths, which are themselves a sort
> Of elements and agents, under powers,
> Subordinate helpers of the living mind."*

These are represented by ideas of Duty, Danger, Convenience, or Pleasure, and they determine the final impulse. The animal, or unreasoning savage, sees his food or his female, and this sight excites in him the impulse to move towards the object; but the animal, or the savage, may check this impulse by a mental representation of some consequence of his act: when experience has registered painful consequences, arising under similar circumstances, the intelligent dog, who has been beaten for seizing food that was not given him by his master, mentally associates the beating with the act, and henceforward will not seize food, unless the hunger-impulse be very powerful. The intelligent man has wider experience, and consequently more deliberative representation, a larger vision of collateral results—this is what constitutes his intellect; but when violently agitated, drunk, or insane, he too obeys the primary impulse.

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* WORDSWORTH.

71. While Experience modifies the Sensorium, and consequently modifies Conduct by redirecting primary impulses, the final response on a stimulation is always determined by the *psychostatical condition;* and did we fully know the whole history of the organism, we could predict with absolute certainty what the response in every case would be. In instinctive and automatic actions this prediction is to a great extent feasible, when we know the nature of the organism and its habitual manifestations. In rational actions such prediction is only feasible approximately: the elements of the problem are then too variable; we may reckon on the constancy of the intellectual processes, but we do not know the materials on which these operate, we do not know what experiences have been registered, and those which belong to the systemic, emotive region are quite beyond calculation, being emphatically individual. Thus while no healthy man can be made to see that black is green, or to think a logical contradiction—no obscure visceral stimulations, no past experiences having any disturbing influence here—yet his perceptions of external objects and his interpretations of events are largely determined by prepossessions and emotions. Not only is it true that we only see what interests us, and see it in the light of our interests; but our vision is so biassed by nascent feelings that we often see only what we expect to see—the sensible image being replaced by the mental image. Thus the surgeon has been known to see the blood spurt out *before* he saw the lancet pierce the skin. No little of what passes for micro-

scopic observation is the substitution of a mental image for the optical image. Mr. Dendy relates that being at an evening party two or three days after the execution of Ney, he and many other guests, hearing the servant announce "M. Maréchal ainé," *heard* the name "M. le Maréchal Ney," and a shudder ran through the company. "For a few seconds," adds Mr. Dendy, "I distinctly saw the figure of the Marshal in place of M. Maréchal."

If the sensorial state has this influence over the senses, it has a greater influence over the opinions. Who does not know how a desire will direct us towards the discovery of the means of gratifying it, and invent the sophisms which will quiet conscience and justify those means? Who does not know how the wish to find some proposition true will suppress the adverse evidence and intensify the favourable evidence? *Cognition has here its impulse in desire, and judgment is the satisfaction of the impulse.* Orators from the beginning have directed their eloquence to the feelings as the most coercive of arguments; if they can excite the hopes or the fears of an audience, the indignation, pity, and terror thus roused will supply the place of reasons, and their cause is gained. The fanatic can feel no repulsion at atrocities: they cease to be atrocious to him when they further his views. The sentimentalist sees no irrationality in conceptions which are in harmony with his sentiments, for he does not pause to verify their congruity with facts; his conviction is swayed by their congruity with his desires.

72. Our Inner Life is thus variously blended. External stimulations, internal stimulations, past

experiences modifying the effects of present experiences: the Soul is a history, and its activities the products of that history. Each mental state is a state of the whole Sensorium: one stroke sets the whole vibrating. The dog hears a rustling in the grass, and is at once arrested, because with this sensation there is connected a desire: a different sound leaves him unaffected, but this one excites his predatory instinct: his eyes are fixed on the spot, his ears are pricked, all his muscles are in tension, ready for a spring. The attitude of his sensorium is expressed by the attitude of his organism. The sensorial attitude is partly dependent on the mechanism of his canine nature, and partly on acquired experiences. I speak to him: this is a new sensation, and being interpreted by him as the sound of my voice stirs up a number of dormant feelings which give a new attitude to his Sensorium:—it may be faint and evanescent, so that he responds by a gentle wagging of his tail, without removing his eyes from the grass, or changing the tension of his spring; it may be more vivid and enduring, so that he turns towards me with ears dropped and muscles relaxed. He then sees me offering a bit of biscuit, or pointing to a cat in the distance; his attitude is at once changed. And so on throughout the day: each new impression alters the sensorial state.

CHAPTER IX.

SOME LAWS OF OPERATION.

73. THE activities of sense, although always involving a varying admixture of intellectual and volitional activities, the withdrawal of which would be the destruction of the phenomenon, are predominantly *affective;* and whether belonging to Sensation, Appetite, Instinct, or Emotion, are recognisable as due to the immediate and definite stimulation of the senses or sensitive surfaces. The activities of Intellect, on the contrary, are recognisable as due to mediate stimulation, and from very fluctuating conditions; but its laws of operation are the same as those of sense. The general Laws of Sensibility having been considered, we will here glance at some of the derivative laws which declare themselves more and more decisively with the development of the organism.

ADAPTATION.

74. There is a marked tendency in organic substance to vary under varying conditions, the result of which is individualisation of certain parts, so that growth is accompanied by differentiation of structure. Were this tendency uncontrolled, there would be no

organic unity; and even were it sufficiently controlled by what I have shown to be the "struggle for existence" in the competition of the tissues, so as to result in differentiated organs,* there would still be no unity of the organism. But owing to the solidarity which underlies all differentiation, and permits of reintegration, the individualised parts are all connected, all interdependent. Thus each part is a new power, and because subordinated to the whole, enhances the power of the whole, and is in turn enhanced by it. As in social life, perfect action is secured by the co-operation of independent agents—Freedom is subordinated to Law, and Law secures Freedom. In mental life the result of incessant stimulation would be incoherence and imbecility, were it not for the restraint of "organised experiences," which assimilate to themselves the new material. It is by the evolution of organs that the organism adapts itself more and more to the external medium. It is by the organisation of its experiences that the organism enlarges its powers. Mr. Herbert Spencer has expounded this evolution of Life and Mind with such fertility of illustration, that I need here only refer to what he has written.

75. Besides the static aspect of Adaptation, which includes the Organs formed, and the organised tendencies of registered experience, we must take account of the dynamic aspect, which may be likened to what is called the "accommodation" of the eye. Its most conspicuous intellectual phenomenon is Attention. It is also discernible in those tentative efforts by which, 1°, in the Logic of Feeling one action

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* *Physical Basis*, Problem I.

that gratifies a desire is finally hit upon, out of several nascent impulses aroused by the desire; and, 2°, in the Logic of Signs, the conclusion is reached which the mind recognises as a true representation of the facts. *Expectation* is a state in which we are adapting the organism to a particular response that is dimly felt in desire, or clearly seen in thought; and hence the discomfort felt when this expectation is contradicted; the satisfaction, when it is fulfilled. The animal, expecting the appearance of its prey, is ready to spring; all its muscles are adapted to that spring. The mind expecting the emergence of a particular thought as the conclusion of its search, is also ready to spring, and will seize only such evidences as lead to that conclusion. There are certain mental combinations which are impossible to us, though we cannot say the objective facts themselves are not to be thus combined; we cannot combine the image of a circle with the image of its loudness, as we can with the image of its hardness, simply because our organs have never been adapted to such a blending of impressions. Yet many mental combinations, like many muscular combinations which are now impossible, may become possible through new adaptations, for perceptions which now seem the birthright of the organism were in truth slowly acquired through successive adaptations of the organ, directed by and directing that adaptation of the organism which is called Attention.

This brings us to the consideration of the

LAW OF INTEREST.

76. We only see what interests us, or has once interested us. We only know what is sufficiently like former experiences to become incorporated with them. It is the same desire which impels each movement of the Attention, directing the current in this way rather than in another, and it is the satisfaction of the desire which quiets the movement, and allows some fresh direction of the current. Myriads of impressions are made upon the sensitive surface which never excite more than the faintest attention, never enter into clear consciousness, because they have no interest for us, *i.e.*, are not, however remotely, linked on to our desires: exciting no emotion, unconnected with our motor-impulses, they are as completely outside our world, as the ecclesiastical squabbles of Bonzes or of Pandits are outside the debates of Parish Boards or Convocations. Our ancestors saw no beauty in a rocky ravine, or in a stormy cataract; the only interest a landscape had for them was its suggestion of a hunting-ground, an encampment, or an agricultural resting-place. Æsthetic interest once awakened, the senses become more and more sharpened in the perception of æsthetic objects. It is the same with speculative interests.

PREPERCEPTION.

76a. Thus it is that one modification of the Sensorium becomes the source of others, and shapes them. Each perception is itself the revival of many past experiences, and is by them *apperceived*, to use the once familiar term. Analysis discloses that the escort of nascent states which accompanies a sensation is composed of innumerable impressions, many of them quite outside the "series" of Consciousness. Why, for example, do we start on hearing one particular noise, and remain unmoved by myriads of louder noises? It is because we perceive this noise to be the explosion of a firearm, the smash of a window, or the cry of some one in distress; and this perception is the revival of past experiences. But we also start on suddenly hearing a sound which is quite unfamiliar: it is this very strangeness — this disagreement with registered experience—which excites the emotion; whereas the familiar sounds are perceived to be such or such, and to have no emotive reference.

77. It is by the *residua*, or modifications impressed by past experiences, that fresh perceptions are cognised, and old ones *re*-cognised. The artist sees details where to other eyes there is a vague or confused mass; the naturalist sees an animal where the ordinary eye only sees a form: he detects what (when examined under the microscope) will prove to be a lovely marine organism, where the common beholder hardly detects an insignificant bubble. The perception once effected, it is not only *re*-perceived when the object is again present, but it aids in the perception of other objects slightly resembling it. So in thought. The formation of one idea, in itself seemingly insignificant, will often be the nidus or starting-point of a whole system. Physiologically speaking, no food is assimilable by the organism in

its crude state; it has to be dissolved, taken up into the plasma, thence passing into the plasmodes, where it is assimilated molecule by molecule. The carbonate of lime, for example, will not directly add itself to the osseous tissue; it must be soluble, and pass into the osseous plasmode. And the new object presented to Sense, or the new idea presented to Thought, must also be *soluble in old experiences*, be *re*-cognised as like them, otherwise it will be unperceived, uncomprehended. A conception which is novel, or largely novel, is unintelligible even to the acutest intellect; it must be prepared for, *pre*-conceived, and by the exhibition of its points of similarity and attachment with familiar conceptions, its congruity with these may become the ground of its acceptance.*

ORIENTATION.

78. Another form of this law is what may be named Orientation, which is an extension of the Law of Preperception. It is the process of verification in Sense or Intellect by which we *take our bearings*, and recognise the true relations of objects both towards each other and towards ourselves. Awaken a man suddenly, and his first thought will be, Where am I? Until he has fixed his position as a centre to

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* "The track of every canoe, of every vessel that has yet disturbed the surface of the ocean, remains for ever registered in the future movement of all succeeding particles which may occupy its place. The furrow which is left is indeed instantly filled up by the closing waters; but they draw after them other and larger portions of the surrounding element, and these again, once moved, communicate motion to others in endless succession." BABBAGE: *Ninth Bridgewater Treatise*, p. 115.

which all things are referred, he is uneasy, his mental state chaotic. He must always have a landmark, or standard, in some known point, by which to arrange relative positions; his own person is the central position. Would he verify an inference? it is by reducing it to a sensation. Would he verify a conclusion? it is by reducing it to its premisses. Would he verify an induction? it is by referring it to prior inductions. The objective landscape of Sense is determined by this Orientation, whereby each object has its relative position, and all positions are connected with our own; the subjective landscape of Thought is also then determined, each image and idea having its relative position, and its connection with the *system*, or series, of Consciousness. In walking through life, as in walking through a street, we are perpetually thus "taking our bearings," readjusting the mind to changing objects and relations. We pass along a plank only a foot wide with perfect ease, if it be on the ground, or only slightly elevated; but if raised many feet above the ground, we pass along it with care, anxiety, or terror. The ease is determined by Orientation rapidly assuring us that a false step will not have the disastrous consequences in the one case that it will have in the other. We have taken our bearings and foreseen the results. It is by a similar process that Reverie is preserved from passing into Delusion, and that we distinguish a scene perceived from a scene imagined. The imagination may have the vividness of perception and produce a momentary illusion; in poetic and artistic minds this vividness is often intense; but the illusion is momentary, because it is controlled and corrected by simultaneous or succeeding feelings; side-glances at the surroundings enable the mind to "take the bearings." In Dreams and Insanity this Orientation is obstructed and the illusion is permanent: in dreams because there are no sensible surroundings, and because the succession of images is too rapid for the comparison with other contrasting images or ideas—whence the absence of all surprise at the most unwonted combinations: in Insanity, because a disordered condition of the co-ordinating centres prevents the normal Orientation. There is no such escort of nascent states as inevitably suggests incongruity by images of contrast; so that the patient who has just assured you he is God the Father, will quietly reply to the question, "And who is your father?" "A clerk in the Foreign Office;" or, having assured you that his daughter is to be married next week to the son of his friend, will see no incongruity when you remind him that his daughter is only three years old, and the son of his friend only five. He is a millionaire, yet tells you he earns three shillings a day. Each separate group of feelings forming each idea has its affirmation; there is no co-ordination of these groups, and no Orientation.

79. It often occurs that we are in doubt whether we have actually witnessed or only dreamed a particular event; and this doubt is resolved directly we can assign the event to a position in the landscape, or in the series of events, which on other grounds we know to have been actually witnessed. If I believe in the existence of Julius Cæsar, and not in the existence of Falstaff, it is because I can assign the one image to its place in a series of historical antecedents and

consequents, and the other to its place in a poetic series. If I believe in the transmission of a message to America along the telegraphic wires, and do not believe in the transmission of a message from the dead to the living, it is on the same principles.

REINSTATEMENT.

80. This is a fundamental law of mental phenomena. From the constitution of the sentient mechanism, as already explained, every excitation is propagated throughout the system, and thereby excites in varying degrees reactions in the various centres. When any mode of reaction has become habitual, it *tends* to be excited by whatever disturbs the balance of the Sensorium. It is obvious that every mental *state* will be *reinstated* whenever the conditions of its production are reproduced; and the reinstatement will be more or less complete according to the more or less perfect reproduction of the original conditions. The reinstatement of a perception is complete when the original conditions of that perception are again in operation; but its reinstatement in the form of an image of the object is only partial, because the objective sensible conditions are not reproduced.

81. Much of the difficulty of psychological inquiry depends on the obscurity of the unconscious region in which so many powerful influences are in operation. An objective stimulus, we can assign; the sense-organ and its action, we can assign; the laws of combination in the Sensorium, we can assign; and we may vaguely assign the final condition of sensorial *tension*. But the actual state of tension at the

moment is dependent on such a complexity of fluctuating and individual tendencies, that we are unable to estimate it. Besides the residual effect of multiple excitations through the senses, there is the influence of some recurrent stimulation from one of the viscera, or from some emotional shock which has left behind it persistent tremors. Deep down in the recesses of the organism there are thus influences at work, which only emerge into consciousness at intervals, but which are always modulating the mental state. Besides the intellectual and sensible motors which we can detect without difficulty, there are organic motors which are rarely appreciable.

I hope hereafter to illustrate the operation of these deepseated influences; I merely allude to them here to show how complicated are the conditions of Reinstatement. This premised, we may consider three cardinal forms of Reinstatement, known as Memory, Imagination, and Association.

MEMORY.

82. Every sensation has not only its after-sensation, or persistence of subsiding tremors, but also its reinstatement as a recurring sensation, or as a remembered sensation or image. So long as the excitation due to a stimulus persists—say the sound of a bell after the bell has ceased to vibrate—the state is a sensation or after-sensation: though diminished in energy, the subsiding tremors are of the same kind as those originally excited. The same is true when there is a resurgence and recurrence of these tremors in the absence of the stimulus. We cannot, I think, with

propriety call this after-sensation an idea, still less a remembrance. It is a modified reinstatement of the original state. Now that state was not an idea, but a sensation. In order that the reinstatement shall be a remembrance—*i.e.*, a mental attitude, and not simply a repetition of the sensation, *i.e.*, one element in a mental attitude—it is necessary that there should be an escort of other states. We have no more right to class the simple repetition of a sensation under the complex head of Memory, than the repetition of any physical reaction on the recurrence of its stimulus. To hear the sound of a bell, and to remember it as having been heard before, are obviously two different mental states, either of which may be reinstated.

83. We have already seen that every impression leaves a trace, and helps to modify the Sensorium. The excitation produces a change in the neural *plasmode*, which may leave a temporary or permanent trace or modification of the molecular structure; after many repetitions, this modification results in a modulation of sentient activity. The Sensorium then *tends* to react in a particular way, not only in response to direct stimulation, but also in response to indirect stimulation, so that, for example, a child once terrified by the sight of an object will have its terror re-excited by the sight of an object very slightly similar, and also by the name of that object. The motor-organs are here set going by their association with sensorial states; and the excitation of these, although an indirect reinstatement, is far more energetic than the direct excitation. This is a point to be borne in mind as capable of throwing light on facts of hallucination.

84. The physiological explanation of Memory is

that of a modification of structure which survives molecular change in virtue of the *assimilative* process. Sir James Paget, after recalling the many striking examples of the formative process retaining the marks once made upon a particle of tissue, adds "when the brain is said to be essential as the organ or instrument of the Mind in its relations with the external world, not only to the perception of sensation, but to the subsequent intellectual acts, and especially to the memory of things which have been the objects of sense—it is asked, How can the brain be the organ of Memory when you suppose its substance to be ever changing? or how is it that your assumed nutritive change of all the particles of the brain is not as destructive of all memory and knowledge of sensuous things as the sudden destruction by some great injury is? The answer is—because of the exactness of assimilation accomplished in the formative process: the effect once produced by an impression upon the brain, whether in perception or in intellectual act, is fixed and there retained; because the part, be it what it may, which has been thereby changed, is exactly represented in the part which in the course of nutrition succeeds to it. Thus, in the recollection of sensuous things the Mind refers to a brain in which are retained the effects, or rather the likenesses, of changes that past impressions and intellectual acts had made." *

85. But it does not follow that because every impression has modified the Sensorium, therefore every such modification will persist as a reproducible

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* PAGET: *Lectures on Surgical Pathology*, edited by TURNER, 1853, p. 40.

residuum; it may only persist as a component of other *residua*, and only be revivable in them. Nor can the persistence as revivable *residua* be assigned to the vividness of the original impressions or to the frequency of their repetition. We often forget details and events which have been frequently noticed, and even those which had an agitating effect. There are people who cannot remember the colour of the eyes of those whom they are daily seeing; and most people are incapable of more than a vague vacillating reproduction of the images of absent faces. On the other hand, they will remember with great vividness some trivial details noticed perhaps only once and partially, or wholly forget very interesting events. Who does not know what it is to fail entirely in recalling the thoughts or the words of a passage which greatly impressed him; although he can recall the book in which he read it, the aspect of the page, whether it was on the right hand or the left, and the passage at the bottom or the top of the page? The infant who has touched the teapot has a vivid feeling of the pain which follows; but the sight of the teapot does not recall this pain, and so he touches the teapot again, to be again pained. Many adults manifest an equal inability to revive the painful consequences of their acts. One portion of a complex group is reinstated, other portions not.

86. It is clear from what has just been said that although vividness and frequency are important conditions, they do not of themselves suffice. Nor will the well-known laws of Association suffice unless these be extended so as to embrace the Analogy of Feeling. While it is true, and physiologically

deducible *à priori*, that the presence of one or more components of a group will tend to revive the other components, and thus a reinstatement of feeling be produced by the recurrence of some of its original conditions; it is not true that one feeling succeeds another or one feeling recalls another, *only* because their ideas have been associated in experience. The emotional factor must be included.

87. Perception is a reinstatement, but it is not Memory. In perceiving an object, I do not remember its having affected my different senses in different ways. I do not remember that sugar is sweet, when the sugar is before me; though I may remember some occasion when I felt the sweetness. This escort of states constituting the *field of personal experience*—this act of Orientation—we designate as Memory. It has many gradations. In the lower animals there is probably no such personal escort accompanying sensations. In the higher animals it may be slight and obscure; so that we may often doubt whether they have what is here called Memory, although they certainly act *as if* they remembered. We cannot know this. It may be as Buffon says: "L'image principale et présente appelle les images anciennes et accessoires; ils sentent comme ils ont senti, ils agissent comme ils ont agi; ils voient ensemble le passé et le présent, sans les distinguer et par conséquent sans les connaître." We cannot say whether the dog who sees you hold up a stick in a certain way has any vision of the beating he formerly experienced, any more than when you see sugar you have any reproduction of the sweetness you formerly tasted; but it is clear that unless the past experiences were

reinstated by the presence of the immediate feeling, the dog would never stir when the stick was raised. If the escort of feelings included images of the place where he was beaten, of his beaten person, or of the actions of escape, it would be a case of true Memory; but this is doubtful. Nor does the fact of his acting precisely as he did then, remove this doubt; for when experiences have been *organised* they tend to become unconscious and automatic.

88. Having thus connected Memory with Orientation, and shown how it implies more or less inclusion of the field of personal experience, it is easy to explain the Forgetfulness which is the disruption of the links whereby present feelings are associated with that field; as distinguished from the Forgetfulness of a fact or a name, which is the disruption of the association between two images. We may also explain two other kinds of Forgetfulness. In the one there is a temporary disturbance, or destruction, of the particular mechanism by which particular ideas, images, or acts arise. This characterises the failures of special memories conspicuous in pathological cases where certain words, certain images, or certain acts, have become impossible, though other words, images, and acts are normally producible. The patient cannot form the word, but he can recognise it if another speaks it; or he can neither form nor recognise the word. He has lost all memory of faces or scenes, but remembers words and other signs. He has lost all memory of words, but remembers numbers. And so on. But in the other case alluded to, the disturbance or destruction has been confined to the associative mechanism, so that although words, images, and

acts severally arise, the one word, image, or act is incapable of recalling the words, images, or acts hitherto connected with it. The following case shows how mere vividness of impression will not suffice for remembrance.

89. When the sheets of my work on the Physiology of Common Life were passing through the press, I was one evening listening to a sonate of Beethoven's, and the musical excitation had its usual effect on me of causing great cerebral activity, especially in the combination and recombination of images necessary to the invention of experiments. Suddenly there flashed upon me what would be a crucial experiment. The next day was partly occupied in thinking over the experiment, and partly in preparing the means. It was performed on the third day, and with such success that I was greatly elated, and talked it over with my wife during our walk. Here was an elaborate procedure which occupied my mind with agitating excitement for many hours; the kind of experience, one would say, that was least likely to be forgotten; yet I afterwards discovered on turning over my note-book that the year before I had conceived and executed this very experiment, for this very purpose, and with the same results! There must therefore have been a reinstatement of most of the feelings *except the personal escort*, yet there was absolutely no remembrance of them, and I was as elated at the repetition as if it had been a totally new experience.

In forgetting the name of a plant, or in forgetting the date of an event, there is likewise a failure of reinstatement, but it has little obvious reference to the field of personal experience; although when we try to recall the name we become aware that there is such a reference, and that by recalling the places where we saw the plant, the circumstances under which we learned it, or some events connected with the date, the forgotten link is restored.

90. The higher form of Memory called Recollection may safely be said to be exclusively human. It differs from the lower, or animal form, as the Voluntary differs from the Involuntary. In Memory, images and ideas arise spontaneously; they are "unbidden," and intrude themselves into the current of thought. But in Recollection there is an effort, a search, and a finding. We desire to recall a date, a fact, a name; and we try the various suggestions which spontaneously arise, till the right track be hit upon. The difference between remembering and recollecting, is the difference between seeing and seeking.

91. The ancient and still unexploded error which treats Memory as an independent function, or faculty, for which a separate organ, or seat, is sought, arises from the tendency continually to be noticed of personifying an abstraction. Instead of recognising it as the shorthand expression for what is common to all concrete facts of remembrance, or for the sum of such facts, many writers suppose it to have an existence apart. Hence although patients are described as totally incapable of recalling a certain class of feelings, they are said to have "Memory unaffected" if at the same time they recall other classes of feelings; just as their Intelligence is said to remain unaffected when they can reason correctly on some subjects, although on others they are incoherent. "Chez tous

les aliénés," says Voisin, "les sentiments affectifs sont très-affaiblis, ou nuls : la mort d'un proche, d'un père, d'une mère leur est à peu près indifférente : *cependant leur mémoire reste normale.*" * Memory of what? Clearly not of the Sentiments, but of the Sensations. They can recall the experiences of Sense—recall the images of objects and events in some relations, but not in others. They recall the names and forms of friends and parents, but not the old escorts of feeling which were wont to accompany these.

It is obvious that Memory as a process of reinstatement may exist for some groups, yet be defective or destroyed for others. It is obvious also that Memory as a general term expressing the total of residua which are capable of reinstatement, must be affected when some of its components are absent.

Gall was much nearer the truth when he assigned to each faculty its own Memory, and denied the existence of an independent Memory in general. But even he had too restricted a conception. Memory is the general term for the reinstatement of mental states following on the reproduction of one or more of the conditions of their production. Why this reinstatement readily occurs in one person with reference to dates, in another with reference to names, in a third with reference to forms, in a fourth with reference to relations, depends on very complex circumstances, among which special interest and frequent repetition play their part. Special degrees of excitability in the organs must also be taken into account; though this also may be partly cause and partly effect of the greater interest felt. A man like

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* VOISIN : *Leçons Cliniques des Maladies Mentales*, 1876, p. 41.

Menétrier, who could repeat three hundred disconnected words after once hearing them, or like Pico di Mirandola, who could remember two thousand names, or like Mezzofanti, who knew a vast number of languages with their dialects, may justly be said to have a powerful verbal memory; and one like Heidegger, who after walking through a street half a mile long was able to tell every shop he had passed and assign it its relative position, must have a keen memory of objects. But as we know from Robert Houdin's narrative that similar facilities may be acquired by practice, it is difficult to say how much of this is primarily due to a native disposition.

IMAGINATION.

92. As we distinguish between Memory and Recollection, so may we distinguish between spontaneous Imagination and plastic Imagination. The rise of images that were once sensations, and the spontaneous combination of these images, take place incessantly in waking thought, in reverie, and in dreams. It differs from memory in that its personal escort has reference to the present or future, not to the past. We imagine a lion as now before us, or before us at some future day; we remember the lion we saw last week. We imagine the interview about to take place; we remember the one which did take place. We may imagine a scene and ourselves as spectators, and the vision be so vivid, or so uncorrected by Orientation, that for the moment, and even afterwards, we believe that we witnessed it. In Dreams and Insanity this is so. In waking sanity

it is often difficult to decide whether we really witnessed the scene we imagine. I cannot now say whether I was actually present at the burning of the Houses of Parliament, or whether my vision of it is constructed from hearsay, report, and pictures. But I am quite certain that I did not see Napoleon at Elba, nor witness the murder of Duncan.

93. Mill holds that the difference between Memory and Imagination is simply that between a sensation and its idea.* But if we understand, as he does, an idea to be the faint form of a sensation, it is clear that there is more than the difference in vividness, since the mental state when imagining a scene is quite as vivid as when remembering the scene.

The reinstatement of images, and the recombination of them when not left to the uncontrolled influence of suggestion, but controlled by a conscious effort directing the order of combination, is that which commonly passes under the term Imagination; and its products are so important and sometimes so marvellous that we can well understand how Imagination has been not only personified, and transformed into an independent agent, but has taxed the rhetorical ingenuity of writers in describing it. Although its elements are the residua of experiences, it is always a reinstatement with a purpose. This purpose may be practical, speculative, or æsthetic, and the Imagination will be the invention of plans for the conduct of life, or for the conquest of Nature; the invention of formulæ, for the gratification of speculative desires, in explanation of Nature by the orderly recombination of isolated experiences; the invention of forms, scenes, characters, events, for the gratification of æsthetic needs. As in Recollection we reject all the rising suggestions which do not harmonise with the desired end, so in Imagination we reject all the images which are felt not to cohere with our dominant purpose. In practical and speculative Imagination this rejection is imperative—any admixture of images which do not represent the actual order of external fact, is disturbing, perhaps fatal to success. But in æsthetic Imagination there is greater latitude: the object being a pleasurable effect, if *that* is secured by a departure from the actual order, the departure is warranted. But an exquisite æsthetic sensibility is needed to decide what extent of departure will secure this pleasurable effect in any particular case.

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* Analysis, i. 412.

ASSOCIATION.

94. The most fundamental of operations is Grouping, and Association is a special form of it: the Grouping of groups which are not connected by any necessary anatomical links. Processes which depend on the native mechanism, although dependent on the connection of groups, are not called associative processes. Association is acquisition. Hence it is most commonly applied rather to ideas than to emotions and sensations; though we also have to take into account associated feelings and associated movements.

95. The laws of Association, thus conceived, are no doubt familiar to my readers, who will at any rate find them expounded by Professor Bain with such

wealth and felicity of illustration that nothing need be added here. Only two points may be touched on. One is the enormous influence of the emotional factor—the Analogy of Feeling—in determining the reinstatement of images and ideas.* The other is the influence of obscure organic motors, manifested in the sudden *irruption* of incongruous states—the orderly course of association being burst in upon by images and ideas having none of the normal associative links. In both we recognise the operation of those deepseated causes already referred to in this chapter. The connection of two images or ideas is effected by the similarity in the escort of the neural groups. It is not enough that the two experiences should have been connected in time or place; the ideas may never before have been in conjunction, yet if both are connected with a common feeling, or if both contain one element in common, this will suffice. Thus my reading was interrupted the other day by the question: "What was the name of King Arthur's sword?" The word *Claribel* first arose—not assuredly from any association with "King Arthur" or with "sword." It was at once rejected as incongruous, *i.e.*, as not reinstating the feeling formerly associated with King Arthur; but there was nevertheless a dim analogy at work, and when the name *Excalibur* arose, the faint resemblance in some of the elements of sound was seen to have been the cause. Another day I was pondering on a remark of Kant's when the current of my thoughts was diverted by the question from my wife: "What is meant by *reprinted from the Translations of the Social Science Association?*" Instantaneously I replied, "*The Transactions*." "Here it is—the translations," she said. "A misprint," was my answer. Reflecting on the rapidity with which the mistake was seen and rectified, I retraced the process. The phrase first called up a sense of incongruity, which was not such as would have arisen had there been no recognisable and congruous elements present—such, for example, as if the phrase had been, "The Translations of *the Khi Khi Society*." Then I should simply have felt that I did not know anything corresponding to it. But I did have a sense of the incongruity, and in this there was one element which sufficed to rectify it—that element was the sound *trans*, which formed a common element both in translations and transactions.

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* DITTMAR, *Vorlesungen über Psychiatrie*, 1878, p. 74.

Who does not know what it is to see "faces in the fire" and animal forms in the shifting clouds? Who does not know what it is to transform some monotonous succession of sounds into a varied melody? The mind lays hold of certain sensible impressions, and completes them by the reinstatement of groups having only these impressions in common.

96. One day I was riding through the London streets in a cab, my thoughts occupied with my son lying on a sick couch at home, when I became conscious of a sonata of Haydn's sounding in my brain. I have frequently noticed that the sound of a vehicle stimulates some musical revival. This particular sonata was revived, rather than another, because three days before my wife had soothed the sufferer by playing it to him. It is true that at the same time she played pieces by Schubert and Donizetti; and since these would as naturally have been associated with

the image of my son by the laws of contiguity, the revival of Haydn's sonata must have been due to some special link—probably a faint analogy in the rhythm of the cab sounds with the rhythm of some phrase in the sonata. This at any rate was the traceable link between Haydn's phrase and the image of Barcelona which succeeded it. I had not heard Haydn's sonata at Barcelona, but I had heard a comic opera there, and a chorus in this opera was built upon a phrase very like that in the sonata. From Spain my thoughts rapidly passed to Baillarger's Memoir on Hallucination. The link of feeling was the same here. I had been waiting for the cessation of the sonata to take up Baillarger's Memoir, which had arrived that afternoon from the bookseller. In these cases the ground-tone of feeling was that roused by the thought of my sick son, which persisted throughout the various successions of feeling excited by the sights and sounds of the street. Any two images having this link of connection might have arisen, and those which did arise had some direct connection.

The other day just before dinner, when hunger made me yawn several times, my wife played for the first time a melody of Schumann's. I do not think that there was any recurrence of that melody during the next day until just as I was sitting down to dinner, when it suddenly recurred, and continued at intervals all the rest of the evening. It seems to me that what revived these sounds was the partial reinstatement of the visceral sensations; the mere act of yawning would probably not have recalled the associated melody at any other time, but when the yawning was part of a state of hunger, and had an escort of other feelings similar to those which accompanied the hearing of the melody, the reinstatement was easy. Schüle relates that a patient who was periodically insane always knew when an attack was about to recur, because the image of a grey bird hovered before his eyes. This image, having once been the hallucination of a premonitory attack, became associated with the organic state, and the recurrence of that state was the reinstatement of the image.*

97. In speaking a foreign language, if we know more than one, it rarely occurs that when a word fails us we supply its place by the equivalent in our own

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* Sir Benjamin Brodie cites the following example from the letter of a friend : "When I was about fifteen years of age I went with my father and mother and friends on a tour through Somersetshire ; and having arrived at Wellington, where I had certainly never been before, we tarried an hour or two at the 'Squirrel' Inn. On entering the room where the rest of the party were assembled, I found myself suddenly surprised and pursued by a pack of strange, shadowy, infantile images too vague to be called recollections, too distinct and persevering to be dismissed as phantasms. Whichever way I turned my eyes, faint and imperfect pictures of persons once familiar to my childhood, and feeble outlines of events long passed away, came crowding upon me and vanishing again in rapid succession. A wild reverie of early childhood, half illusion, half reality, seized me, for which I could not account ; and when I attempted to fix and examine any one of the images, it fled like a phantom from my grasp, and was immediately succeeded by another equally confused and volatile. I felt assured that all this was not a mere trick of the imagination. It seemed to me rather that enfeebled memory was by some sudden impulse set actively at work, endeavouring to recall the forms of past realities, long overlaid and almost lost behind the throng of subsequent events. My uneasiness was noticed by my mother ; and when I had described my sensations the whole mystery was solved by the discovery that the pattern of the wall-paper in the room was precisely similar to that of my nursery at Paddington, which I had never seen since I was between four and five years of age. I did not immediately remember the paper ; but I was soon satisfied that it was indeed the medium of association through which all those ill-defined and half-faded forms had travelled up to light ; my nurse and nursery events being, after all, but very faintly pictured on the eld of my remembrance." BRODIE : *Works*, 1865, i. 287 ; *Psychological Inquiries*, Part II.

tongue; we usually replace it by the equivalent in some other tongue. Is not the reason this, that we are for the time being in an attitude of feeling when only foreign expressions are suggested? We are, so to speak, in a region of extra-active associations. If when in Italy we hear a knock at the chamber-door, we rarely say 'Come in,' but we also often forget to say 'Avanti,' and in that case we say 'Entrez,' or 'Adelante,' or 'Herein'—according as residence in France, Spain, or Germany has made one term or another the most ready to arise. If we are asleep when the knock is heard, we first exclaim 'Come in,' and then correct it by 'Entrez,' 'Herein,' 'Adelante,' or 'Avanti,' as a more perfect Orientation recalls the consciousness of what is needed. But it is particularly noticeable that in conversing with a German I do not supply the needed word by an English equivalent (unless I have been accustomed to speak English to him); it is always a French or Italian equivalent which first arises.

I was one day relating a visit to the Epileptic Hospital, and intending to name the friend, Dr. Bastian, who accompanied me, I said, "Dr. Brinton;" then immediately corrected this with, "Dr. Bridges,"—this also was rejected, and "Dr. Bastian" was pronounced. I was under no confusion whatever as to the persons, but having imperfectly adjusted the group of muscles necessary for the articulation of the one name, the one element which was common to that group and to the others, namely B, served to recall all three. Who does not know how in trying to recollect a name we are tormented with the sense of its beginning with a certain letter, and how by keeping this letter constantly before the mind at last the whole group emerges? Nay, it is not necessary to keep the letter consciously present. Baffled in the attempt to recall the name, we desist, think and talk of quite unrelated things, and suddenly after hours, perhaps days, the name flashes upon the mind. This can only be explained by a residual tendency of search, which from time to time reinstates some one element of the group; when this element combines with incongruous elements the result is unnoticed, but directly it strikes into the path of the familiar group the whole process is completed, and the *desired end* is reached. The emotional factor here is conspicuous.

98. Another illustration of this analogy of feeling is that we sometimes believe that we remember events which, there is proof positive, could never have been experienced by us; and *vice versa*, believe that to be a novel experience which we can prove to have been felt by us before. We are in a foreign land for the first time; a sudden turn of the road or winding of the stream brings us in presence of a scene which cannot have been seen by us before, and yet it arouses the vivid sensation of one already familiar. The illusion for a moment is complete. Dr. Wigan relates that during the funeral of the Princess Charlotte in Windsor Chapel, at which he was present, there suddenly came over him the sense of his having once before witnessed the whole spectacle. Obscure analogies of feeling were obviously at work here. Every one will recall occasions when on being introduced to strangers he felt that he had seen them before; or when reading a book

containing new thoughts he felt that these thoughts had been present to him before. It is because the novel thought harmonises with pre-existing thoughts; or else because the thrill of emotion diffuses itself over the field of consciousness, and obliterates the landmarks whereby new and old would be distinguished—as in Dr. Wigan's case. But this very obliteration will constitute obliviscence. We find ourselves thrilled with delight at a passage which seems quite novel to us, although proof of our having formerly read and admired the passage stares us in the face in the shape of our pencil marks on the margin.

99. This illusion of having before experienced what we know to be entirely novel, arises, I conceive, from two different causes. Besides the one just mentioned, there is the recurrent effect of a shock, the echo of the passing sensation. We have only to attend to our sensations to be aware that they do not cease with the cessation of the stimulus—the tones keep sounding in our ears, the forms and colours continue, fade, disappear, and reappear, sometimes with fresh energy. Now when a wave of feeling has swept through us, and another similar though fainter wave succeeds, this secondary feeling will naturally be mistaken for a vague remembrance—the resemblance between the two being accompanied by a difference in intensity which throws the second as it were into the distance. Sander had a patient who when told that an acquaintance had died was seized with indefinable terror, for it appeared to him that he had lived through this experience already.—"I felt that I had once before been lying here, in this bed, and that *K.* had come to me

and said, 'Müller is dead;' and I replied, 'Müller died some time ago; he can't die twice.'"* Here it is obvious that the shock of the announcement had its echo, and the echo seemed to be a distant experience.

100. From these and many other examples it is evident that Memory is something more than Association, something more than the simple recurrence of a mental state. Were it the pure operation of Association, one idea would always revive the other originally joined to it in experience either through Contiguity or Contrast. The similarity may be that of the mental state underlying the two experiences which forms the ground of revival; or it may be the similarity between two of the components of such experiences. For example: the sight of dates is associated with the taste of dates, and with dessert-tables, or shop-windows. We do not remember that dates are lusciously sweet, but we do remember the house or the shop where we saw the dates. I have seen dates in more shop-windows, and at more dessert-tables than I can count, and have only once seen them in a palm grove. The other day I saw a boy in the street eating dates, and there arose before me a vision of Alicante: I was again standing under a cloudless sky, looking down a palm grove; the dates hung in golden clusters on the trees; the tinkling of a guitar and the monotonous chant of a joyous company were wafted from a cart which slowly approached through the grove; the whole scene with its accompanying reminiscences was revived, probably because I had been at an earlier part of the

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* *Archiv für Psychiatrie*, 1873, iv. p. 246.

day thinking of Spain (though I am not aware that this was so), or probably because there was some dim suggestion from the blue sky, then overhead, which mingled with other organic states having a resultant state of sub-consciousness like to that which existed during the Alicante experience.

101. The influence of these deeper analogies of feeling is traceable in the abrupt obtrusion of an image, or idea, in the course of an associated series. You are thinking, let us say, of Aristotle. By the familiar laws of Contiguity, Similarity, and Contrast, the images which succeed Aristotle are Plato, Telesio, Alexander, Bacon, or the Port Royal. Say that you have passed from Aristotle through Plato to Port Royal, and suddenly, instead of some idea associated with the Port Royal succeeding, an idea of a railway, or of the woman you love, or of some injury recently received, gives a new direction to your mind. In vain you seek the links connecting these topics with Port Royal, or with Plato, or with Aristotle. These ideas are not associated. The succession has a deeper source in a state of feeling which may or may not have an indirect relation to them. Thus the railway is abruptly intruded because the sound of a clock, or the scream of a whistle, is heard; the image of the loved one is suggested by some visceral sensation, or by the eye resting on some object associated with her. In these cases there is no connection; but an indirect connection may exist which will cause the image of the woman you love to succeed that of the Port Royal, if Port Royal recalled Pascal, and Pascal recalled his sister.

The other night in bed I amused myself by retracing a few successions. Here is one : I was thinking of Comte, then of Kant, then of Socrates, then of pointer dogs, and then the names "Stagg and Mantle" came up. Why did pointers succeed Socrates, and the name of a haberdashery firm succeed the pointers? Clearly by no laws of Contiguity or Similarity. As far as I could retrace the process it was this : Earlier in the evening I had been meditating on the many subtle indications by which individual objects are recognised ; how the shepherd knows every sheep in the flock and the huntsman every harrier in the pack, though to other eyes they are all alike. I suppose the harriers recalled pointers by the law of Contiguity, though I could not remember to have thought of pointers on that occasion. Well, this *occurrence* of pointers would naturally tend to a *recurrence*, by that law of reproduction which is conspicuously illustrated in the snatches of melody and fragments of scenes that arise unbidden, and molest us during the day. Such a recurrence, however determined, interrupted the series, and, by superseding the natural connection between the idea of Socrates and any idea associated with it, would in some cases have led to a succession of ideas directly associated with pointers ; but in this case it did nothing of the kind, it was succeeded by the names "Stagg and Mantle." I was some time before I could imagine an explanation of this. These names, seen in passing along Leicester Square, had been like a buzzing fly continually recurring with absurd insistence for two or three days ; whatever I might be thinking of, there would ere long be an intrusion of "Stagg and

Mantle" in the series; and the feeling of incongruity this aroused being like the feeling of incongruity aroused by the juxtaposition of Socrates and pointers, I conclude it was to this analogy of feeling that was due the recurrence of "Stagg and Mantle" immediately after the recurrence of pointers.*

102. The images which arise are neural processes determined by some pre-existing process, itself the result of stimulation, or determined afresh by some fresh stimulation. When the sight of a man recalls images of his family, the good or evil qualities connected with our experience of him, the place where he lives, the deeds he has done, &c., each component image of this complex escort may be the component of some other group of images and so revive them. The revival will depend, 1°, on the harmony of this new group with the ground-tone of feeling or mental predisposition at the time; 2°, with the energy of the image. Thus suppose three clerks see their chief entering the room with a grave expression. They have all similar perceptions of him as a man and as their chief; but the escort in each is various. One is in love with his daughter, and her image will pro-

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* To confirm this explanation, let me add the observation made the morning after the text was written. There was a high wind howling, and as I listened to it my thoughts went by natural suggestion, first from the weather to the crops, then to the *Times* newspaper in which I had yesterday read about the harvest prospects, then to the map of the seat of war printed on a page of the *Times*, then to the weather chart also printed there, then to a fall in the barometer, then (by the suggestion of *mercury* in the barometer) to Olympus, Homer, Mr. Gladstone—and coffee. This sudden break in the link of association I was at once able to refer to its cause—a faint scent of tobacco. I could not be sure whether the scent was objective or subjective—a waft of odour, or the recurrence of an old sensation; but I incline to think it was the latter, because it was so evanescent. At any rate the feeling recalled the associated states of tobacco and coffee enjoyment.

bably take the lead; another is hoping for a rise of salary, and this will take the lead; a third is conscious of some misdemeanour, and the idea of punishment arises; but let there be some trivial irregularity in the chief's appearance, such as a dangling watch-chain from an unbuttoned waistcoat, or a dab of dirt on his coat-sleeve, and this, catching their eyes, will take the lead in spite of their deeper feelings. It will not, however, long continue to suppress the ground-tones. These persist, and always reappear.

103. One of our great surgeons remarked to me on the extraordinary metaphors with which patients will sometimes describe their symptoms. "They will," said he, "declare that they feel as if molten lead were being poured down their back; and I feel tempted to ask them if they ever *knew* what it was to have molten lead poured on them, so as to recognise this likeness." And yet, ridiculous as the description may be for the purpose of enlightening the inquirer, it has its grounds in obscure analogies of feeling. The patient knows the sensation of burning, and the sensation of burning by hot liquids; he knows also the sensation of the weight of lead; and he combines these to express his feeling of liquid burning weight. So when a poet likens a maiden to a lily and her eyes to stars, he is guided by such analogies; he does not mean that the maiden affects his senses as a lily would, but that the grace, beauty, purity of the maiden and of the lily affect his emotions in a somewhat analogous manner. It is in this sense we speak of a bitter taste, a bitter look, a bitter speech, a bitter thought, but never of a bitter diagram or a bitter landscape. The weight of care oppresses us like a

burden; the effort to solve a problem is like the effort to lift a heavy mass, or to shake off an importunate anxiety. The tears of joy and of grief, the scream of delight, of rage, of surprise, of terror; the frown of anger and of concentrated thought, are alike in their central condition.

104. Nay, the fundamental fact of Intelligence —the discernment of Likeness and Unlikeness—is due to this very similarity in the neural groups or sensorial processes. To feel one sensation to be like another, one idea to be like another, is to have a reinstatement of the feeling formerly experienced, accompanied by the excitation of some different feeling. Were the reinstatement absolute, the two sensations would be felt as one, not as two and alike. The various gradations of Likeness, from that which is known as Identity to that of mere Analogy, depend on the accompanying gradations of Unlikeness which at their extreme are Contrast. But there is always a link of Likeness even in Contrast.

105. Besides the analogies of feeling which determine the succession of ideas irrespective of the established associations—a factor very necessary to be borne in mind when explaining certain phenomena—and besides the transitory Moods and Ground-tones of feeling which also intervene, there are in each individual certain influences from silent processes of growth in the soul which make up what is called the Character. In the physical organism there are correlations of growth in parts, such as that of hair and horns, which have no direct functional relation with sexual organs. In the psychical organism there are similar correlations. And in the manifold influ-

ences of experience, modified as these are by the character, certain tendencies are organised, certain preparations are disposed, which only await some incidental stimulus to start into conceptions and acts which seem incongruous and sudden to the man himself as to the onlooker. The gun has been silently charged, and at a touch of the trigger it explodes. This is illustrated in the hallucinations of vanity which alienists call the "mania of greatness"—patients believing in their enormous wealth, rank, and power, because in their sane states they were constantly thinking of wealth, rank, and power in contrast with their poverty and obscurity. Poets, artists, millionaires, and noblemen, who have had their rank and wealth acknowledged, do not, in becoming insane, manifest hallucinations of this kind. Sinogowitz has related a case which plainly discloses the genesis of these forms of hallucination. His patient proclaimed himself to be very rich, very accomplished, and declared that when he mounted a horse in the circus he surpassed all the trained riders. On being snubbed by another patient and called "a vile acrobat," he confessed to Sinogowitz that he had never been in the circus, but had often thought what a fine thing it would be to manage a horse as the riders did.*

106. The "mania of persecution" takes its rise in the *nidus* of anxieties and terrors formed during the sane condition. There are natures predisposed to influences of terror; and vague apprehensions arise in them out of strange visceral sensations, so that they will confess to a feeling of terror "at they know

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* SINOGOWITZ: *Die Geistesstörungen*, 1843, p. 22.

not what." Now when such feelings have been much indulged and exaggerated, any trifling external circumstance will be interpreted in their sense. Some one is observed following them; the motive, not being otherwise intelligible, is interpreted by their emotions; and their imagination pictures the follower as an agent of the police, an emissary of the Jesuits, a servant of their enemy, &c.

107. The actions of men are determined by motives, but the motives are determined by motors lying deep down in the mental structure, the motive or ideal impulse receiving its momentum from the general predisposition. In physiological language we may say that the determination of any impulse is a function, 1°, of the excitability of the organs; 2°, the compass of the irradiation; and, 3°, the pathways of discharge. Hence our frequent mistake of symptoms for causes. We say that drunkenness or sexual excess has caused insanity, when perhaps it was only a symptom of an undeclared disease. The operation of some unsuspected cerebral disease, which afterwards declares itself in the hallucination of the patient who proclaims himself a Prophet, an Emperor, a God, may be early manifested in acts which seem to spring from a thoughtful solicitude for others; here it is not excess of charity or philanthropic scheming which leads to insanity, but incipient insanity which determines the conduct.* Feelings seemingly transient are as it were a gathering spawn, innest themselves in the organism, and are slowly, silently incubated, till they at last burst forth

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* See SCHÜLE: *Handbuch der Geisteskrankheiten*, 1878, p. 185.

in full-formed act or utterance.* As with the "units of sensibility," so with the sub-conscious or unconscious processes, there is a result of summation. We have an example of this in the periodicity of morbid attacks of Epilepsy, for example.

108. The silent growth of *tendencies* in the modifications of the organism explains certain curious facts of what has been called Unconscious Cerebration. Dr. Carpenter tells of a mathematician who had vainly tried to solve a geometrical problem, although he had constructed a figure which was an *approximation* to it. (Note this!) Some years afterwards, on going to bed, he suddenly saw before him the figure which perfectly satisfied all the requisites. The suddenness of this apparition filled him with terror (note this, also, as evidence of cerebral excitability), as if some supernatural power had presented to him the solution of a problem to which his own powers were unequal.

On this case I would remark that the existence of unconscious processes in the region of thought or of action being indisputable, and forming by far the larger part of our psychical activity, the solution of a problem in such an indirect and unconscious manner is not incomprehensible. It is analogous to the familiar fact of suddenly remembering a name hours after we have given up the conscious effort to recall it. As the mathematician had already constructed an approximation to the figure, this would be continually recurring in his thought, and it would lead to various attempts, various combinations, which gradually would bring the approximation closer, or at any rate so dispose the mechanism that some happy impulse would cause it to start in this direction, as a solution crystallises at a touch. The unusual excitability, shown by the terror and the interpretation, rendered such a crystallisation more easy.

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* SCHÜLE: *Geisteskr*, 428, 438.

109. We have already seen how the organism is stimulated from many simultaneous sources, and how each stimulation has its own discharge. It may enter as a component into some larger groups; so that beside the various succession of conscious states there is a series of sub-conscious and unconscious processes going on, any one of which may abruptly break in upon the conscious series. Even before this emergence such conditions are operative. They are motors which determine the direction and complexity of feelings and ideas. What Appetites, Instincts, Habits, are as permanent motors, these modifications are as fluctuating motors.

110. But if it is Character which determines Action, and the part played by general and unconscious processes must always be taken into account, not less is it true that the particular stimulation is equally a factor. There is an incessant formation of neural groups; there is also an incessant disaggregation and reformation of groups. By frequent repetition some groups more readily fall into the old places after stimulation, and are reformed as before. They are then what we call "organised." But—and this is an important point—the *group is never a fixed structure;* it is only a disposition of the elements which is easily re-formed; just as in a Kaleidoscope there are certain groups

of the separate pieces of glass which combine now in one way and now in another, according to impulse. I have formerly explained this to be the real meaning of a *centre*:—not that it is a separate, individualised portion of tissue, having a fixed structure, and only active in this way; but a temporary disposition of the elements, always the same under the same stimulation. Even in an organised tendency so definitely characterised as that of the reflex of Respiration, we find the component parts temporarily united, but also again disunited and entering into other groups. Confining ourselves to the neural process in Respiration, the *centre* is a group of neural elements which demands the constant iteration of sensible stimulation; and these elements enter into other groups, are formed anew, and again reformed as a respiratory centre.

111. The tendency of groups to reform in established lines is at once a source of power and a limitation. The organisation of special Senses and Aptitudes, while enlarging the universe represented in Feeling and Thought, also limits its possible representations by excluding the formation of other groups. If Perception is enlarged by Preperception, and Conception by Preconception, they are also thus restricted as by *blinkers.* The highly civilised social state is far less easily modified than one less organised: existing institutions which give the state its powers are obstacles to the formation of new and better institutions. Discoveries meet with the fiercest opponents in men who have definite conceptions on the subject, without flexibility of mind. This "flexibility" is an organic peculiarity. There are

some minds of great energy, but so little flexibility that they are incapable of readjusting their conceptions; as there are some civilisations which remain stationary for centuries.*

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* I was first writing this chapter in November 1868. At the close of December a correspondent (Mr. Cyples) sent me a privately printed paper on the "Permutation of Ideas," which happened to be in thorough harmony with my own suggestions, and is an interesting contribution on the subject of Association. He formulates the law thus: "*the current idea always permutates on the principle of the least alteration;* viz., apart from the primary sensations intervening, and so giving us other cues, the *idea certain to succeed the one current in the mind is ever that requiring the least modification of the old one to constitute the difference.*" In adducing examples he says: "If what I now think of actually resembles in part what I last thought of, a lesser alteration of the form of ideation was needed for the thinking of that, than for thinking of anything else; and it is easy to understand that the larger the proportion of the old conception available for the new, with the greater facility is the new one formed."

CHAPTER X.

THE NATURE OF CONSCIOUSNESS AND UNCONSCIOUSNESS.

112. AND now, having so far taken our survey of Mind as a function of the organism, we are in a better position to consider the nature of that phenomenon which, according to one definition of it, is the distinguishing characteristic of Mind, and which, according to another definition, is only one of its special modes: in the one case it may be compared with the sensibility of the retina to light and darkness, which potentially includes all colours; in the other case, to the particular sensation of colour as distinguished from that of luminousness. Whoever reflects on the numerous ambiguities and misapprehensions to which the term Consciousness gives rise in philosophical discussion will regret that the term cannot be banished altogether. But since it cannot be banished, our task must be the attempt to give it precise meanings.

113. Very generally the term is synonymous with Feeling, *i.e.*, Sentience; only in this sense may we define Psychology to be the science of the facts of Consciousness. The ambiguity which lies here is in the term Feeling, which is understood as involving Consciousness, whereas Sentience is less ambiguously understood as the action of the sentient organism,

conscious or unconscious. That we can have thoughts and not be conscious of them, perform actions and not be conscious of them, have perceptions and not be conscious of them, are facts which prove that a theory of the Mind must be very imperfect which is limited to conscious states, unless the meaning of the term Conscious be so extended as to include unconscious states. Some writers affirm that to have a sensation or a thought and to be conscious of it "are not two things, but one thing differently named." Here Consciousness is the equivalent of Sentience. The sentient organism has been in action; its action is designated sensation, and sensation is another term for a conscious state.

Other writers, aware that sensible impressions may have their normal reactions without the peculiar quality known as being felt, being conscious; also aware that perceptions may direct our actions and thoughts and enter the train of reasoning without this peculiar quality—just as light may affect the eye without the quality of colour—apply the term Consciousness to this peculiar quality, and say, "To have a sensation and to be conscious of it are two states, involving two distinct organs or agents in their production."* The spiritualist school assigns sensation to the organism and consciousness of sensation to the psyche: the physiological school generally assigns sensation to the sense-organ and consciousness to the brain.

114. Such are the most generally accepted meanings

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* "Ogni qualsiasi operazione dello spirito nostro é incognita à se stessa, ed ha bisogno d'un'altra operazione (riflessione) che ci la riveli." ROSMINI: *Psicologia*, i. 196.

when particular mental states are in question. There is a third meaning, which makes Consciousness the ideal spectator of all the passing phenomena, internal and external. In this sense it is another term for Mind. Again, it is used synonymously with Cognition and with Attention. According to this view, to be affected and not to know that we are affected is to be unconscious of the affection: to attend to the affection is to be conscious of it. Through Cognition it becomes identified with Discrimination and Reflection. Through Attention it is identified with Volition. By either of these two portals the neural process is understood to pass out of the region of molecular movement into the psychical sphere of Consciousness.

Since all these meanings are in use, the student should be on the alert to disengage from them the one meaning which, in each particular passage, the term bears, or ought to bear, and, as a preliminary, he should settle for himself the following questions: 1°, Is Consciousness to be accepted as co-extensive with, and in all respects equivalent to, the reaction of the sentient organism? 2°, If not, is it the superaddition of some activity in a special organ—say the brain—or some spiritual entity, which, being independent of the mechanism of Sensation, may or may not co-operate with it? 3°, Or is it rather to be taken as a phenomenal distinction—a quality of certain mental states due to the particular conditions at the moment; and if so, what are those conditions?

IS CONSCIOUSNESS EQUIVALENT TO SENTIENCE?

115. If the term Consciousness is made coextensive with Sentience (which in many respects would be serviceable), it sweeps away the antithesis Unconsciousness, by which are marked all those sentient reactions that are undiscriminated and unattended to. In presence of this antithesis, which represents our experience, we have no alternative but to regard both terms as Modes of Sentience. We can then understand how mental processes which at one moment are conscious at the next are unconscious, how processes which at first were slow, laborious, and painful, gradually sink into the rapid, easy, and unconscious processes of automatism; and how indeed the very perfection of mental processes is this approach to unconscious and automatic precision.

116. It is no doubt a verbal contradiction to speak of unfelt feelings, unconscious sensations; but no one would object to speak of unfelt states of the sentient organism. "There are myriads of vague feelings," says Mr. Sully, "constantly flitting round the outer zones of consciousness which, being unnoticed, cannot be recalled by memory. Yet these are scarcely to be dignified by the name of sensations. They lack those elements of discrimination and comparison without which no distinct state is possible." (*Intuition and Sensation*, 1874, p. 64.) Obviously all depends on definitions of sensation and mental state. We may or may not call the sentient reaction a sensation when it is indistinct, but we must call it a psychical phenomenon: the indistinctness is the vagueness; the vagueness does not destroy its psychical character.

116a. Every single muscle, nay, every muscle-fibre, has the property of Contractility, and enters as a component into the motor-functions of the organ to which it belongs. The motor-energy of the organ is the sum of the motor-energies of these fibres. No one withdraws from the motor-class the muscles which move only in groups, never isolated; nor does any one imagine that when we learn to move separately a group of muscles which hitherto had only been moveable in conjunction with other muscles, the group has thereby acquired a contractility which it wanted before, so that now it has become a vital motor-agent, whereas previously it was only a mechanical motor-agent. If this is evident with respect to Contractility, why not recognise it with respect to Sensibility? A neural process will be a sentient process because it takes place in a sentient mechanism, whether it be merged in other processes, and form simply a sensible component, or be detached from these by its relative intensity. A sensorial change is effected by a stimulation; it becomes a sensation or a perception only when it excites the reflex of Attention, and is thus, so to speak, detached from the general stream of excitation.

Objects may be imaged on the retina yet not be seen; aerial pulses may beat upon the tympanum yet no sounds be heard. In such cases it is commonly supposed that the sense-organs have been affected but not the brain. This can only be accepted with qualification. The fact that the sights and sounds may afterwards be recalled with great distinctness points to the conclusion that the Sensorium must have been affected at the time of stimulation, but that, owing to the interference of other processes then in activity, the retinal and auditory processes were merged in the general stream, instead of being grouped and detached by a reflex of Attention. For by itself no sensible affection can be more than a passing impulse; if unconnected and ungrouped, it cannot be perceived. Yet even as a passing impulse, unperceived, its influence on the general state of the Sensorium is recognisable in the familiar facts that unperceived details in the structure of a plant or an animal blend with and modify the perceived details; although the eye of the botanist or zoologist distinguishes points which to ordinary eyes are indistinguishable, yet the total effect of perceived and unperceived characters permits a sharp discrimination of species from species and individual from individual. We are sometimes said not to have felt an excitation and to have been unconscious of an action because we are now wholly unconscious of such events, cannot by any effort recall them. But obliviscence is no proof of insentience. The recall of a feeling can only be due to a repetition of the original stimulus, directly changing the state of the Sensorium, or to the indirect stimulation through a change which is associated with the feeling—a re-excitment of the residua. But because there is no indirect stimulation now capable of re-exciting residua, this absence of an associative link is not the evidence that a sentient change was absent.

Further, the absence of any distinct consciousness of a process while it is passing cannot be urged in proof of the process being insentient. E. H. Weber calls attention to the fact, that since demonstrably that portion of the retina by which distinct vision is effected is only one-third of a line in extension, any object larger than this must be successively traversed by the yellow spot before it can be distinctly seen. Now who is conscious of this movement? Any one may become conscious of it by experiment; no one is so before trial. We all are conscious of seeing the whole surface at one indivisible instant, and are not conscious of the movements of the eye. Bessel noticed that it is impossible at one and the same instant to have two sensations, say of sight and sound; yet the oscillation from one to the other is so rapid that we seem to hear and see simultaneously.

117. Instead of taking Consciousness as the essential character of Sentience, and the sole object of psychological investigation, we shall do well to regard it simply as a Mode of Sensibility. By this we extricate our science from the plausible errors of Animal Automatism and the Reflex Theory, which assign a vast variety of mental phenomena to purely mechanical conditions. A neural process may be regarded either as a physiological process of molecular change in the nervous system, or as a psychological process of sentient change; but in reality it is always one process in a complex of related changes; *its physiological or its psychological character necessarily results from its relation to those changes which precede and those which accompany it.* We isolate it by an artifice. When isolated, it is no longer a state of Feeling, no longer a fact of Consciousness, except by the *implied* relations from which we have detached it. When restored thus to its real position as one process in the complex of vital processes, it ceases to

be a physical fact, it becomes a vital fact; and this vital fact has two aspects—one physiological, in which it is a state of the organ, the other psychological, in which it is a state of Feeling.

118. If this be so, the error is patent which supposes that a neural process, the objective aspect of a sentient process, can lapse from the vital to the physical order of phenomena, when, through a change in its relation to other processes, it lapses from the discriminated to the undiscriminated state. The process does not cease to be a sentient process in ceasing to be so far detached from others as to be conscious. Taking Consciousness to be a peculiar Mode of Sentience, we establish a distinction such as that between voluntary and involuntary actions; and, however wide this distinction, we must admit that a voluntary action does not lapse from the vital order to the mechanical order when it ceases to be voluntary and becomes automatic.

119. We must fix clearly in our minds that unconscious and insentient are not equivalent terms. There is a marked antithesis between conscious and unconscious, as there is between the feeling of light and the feeling of darkness; and we have negatives to express them. Darkness is an optical feeling, which, *quâ* sensation, is as positive as that of light,* but in relation to that of light it is negative. Gauss has told us that the mathematical negative is not a denial or obliteration of the positive, but its *other-sidedness;* and this is true of the psychological

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* "Auch die Dunkelheit ist Etwas positives, und wird nur empfunden wo ein Lichtnerv ist."—JOHANNES MÜLLER: *Ueber die phantastischen Gesichtserscheinungen*, 1826, p. 6.

negative. Unconsciousness is a sentient state, not the entire absence of Sentience we attribute to a machine. We ought never to apply the negative to phenomena of an order which does not admit its positive. No one, indeed, would think of calling a machine unconscious or a dog inhuman; but we may call a man inhuman, and a sentient act unconscious.

120. A process may be unconscious, and suddenly, without any increase in its energy, but by a mere change in some concurrent processes which had *masked* it, acquire the distinctness of a conscious state. The movements of the chest in respiration, the movements of the eyes, the sounds of a ticking clock or passing carts, simultaneously affect us; the affections thus produced are one and all unconscious states which at any moment may become conscious, and this not because the movements become more energetic or the sounds louder, nor because their sensorial processes are changed, but simply because of their changed relation to other processes: the attention, which was occupied by some interesting spectacle or some engrossing thought, is now free to move towards the respiratory or auditory sensations, and they then become conscious. Whether we are attentive to the rising and falling of the chest or the tickings of the clock, or inattentive to them, the sensorial processes pursue the same course, and are subject to the same organic conditions. Were we insentient we should not hear, and the neural processes by which the movements of respiration are carried on would be impossible. Being sentient, the processes take place whether attended to or not. But does any one

imagine that an insentient machine can by any change in the relation of its parts acquire Sentience? Would a movement be felt by it because one wheel was arrested here and another accelerated there?

121. The conditions necessary to the production of Consciousness will occupy us presently. I only wish here to note that the conscious state is a *salient* state of Feeling, the unconscious is the *masked* or latent state. Each process would be salient were there not dominant thrills to mask it; as in any system every pressure would cause appreciable movement were there not counter-pressures. The purpose of Naming is the classification of feelings with a view to intelligible communication; when, therefore, one mental state is markedly distinguishable from another, we affix to it a different name. The many changes in the organism which are obscure and fugitive we call unconscious changes; those that are more salient and enduring we call conscious. This suffices for popular use. It is only in philosophic discussion that a difficulty arises.

122. Having thus endeavoured to explain why it is desirable not to make the terms Conscious states and Sentient states equivalents, but, for the sake of due recognition of unconscious states, to let conscious states stand for the salient, discriminated feelings, let me now add that it will be difficult, if not impossible, to avoid the occasional use of the abstract term Consciousness as the equivalent of Sentience, owing to the language of philosophers and ordinary writers having so thoroughly identified them. In speaking of our Consciousness, or of Animal Consciousness, we are obviously using the abstract term

for the whole sum of feelings actual and possible; as in speaking of Life, we mean not one or more vital actions, but the total conception of vital possibilities. When Consciousness thus stands for the total of Feeling, any "conscious state" means that we are made aware of *a* change, which is thereby, so to speak, detached from the total as an object is detached from the general visual field. I am said to be conscious of being *able* to move my arm, though the arm is motionless; but this is obviously a different state from that when I am conscious of moving my arm. In the one case a thought has detached itself; in the other a motor process has detached itself. In both cases, however, there have been actual changes, actual feelings. How do we justify the admission of changes not actually discriminated at the moment, yet proved to be operant? For this we must include Unconsciousness within the sphere of Sentience.

Thus, you are reading a philosophic work, and as you pass from paragraph to paragraph, nay, from sentence to sentence, the visual sensations vanish, the ideas they have raised disappear, neither the perception of the words nor the apprehension of their meanings can be strictly said to be conscious states, if by that is meant that you *reflected* on them severally as they arose; but they have assuredly been present to Consciousness in operating from first to last in leading your mind to the conclusions you have drawn. If any link in the chain of argumentation has been let drop without having grouped together the links it came between, so as to have transmitted its force, we may say that it is out of the psychological sphere; but if it has helped to determine groups which connect the argumentation into a whole, then it must be said to have been operating in the sentient organism. It is not a *conscious state*, but it is in the Consciousness considered as the total psychical activity.

123. The same reasoning applies to the *residua*. All the multitudinous feelings and thoughts which have passed through us, fashioning our present mental structure, our disposition to feel and think in particular ways, are certainly not conscious states, *i.e.*, present discriminated feelings. They operate as sentient conditions, and are as potent in *producing* present conscious states as either the external stimuli or the sense-organs. Now, whether sentient states like these are to be recognised as in Consciousness or not, depends wholly on the definition we adopt. They are in Consciousness the ideal spectator; they are not in Consciousness the discriminated feeling. They are in Consciousness the sum of potential and actual sentient states; they are not in any actual state. We may employ such terms as objective and subjective consciousness to mark those sentient states in which the mind is predominantly occupied with external objects from those in which it is occupied with itself. In gazing on a landscape the varied forms and colours that excite objective perception are sentient states easily distinguishable from those in which we observe the changes in ourselves which these objects effect. In the first case we are absorbed in looking; we are not conscious of ourselves *as* looking, nor of the changes taking place within us. According to the definition of Consciousness adopted

by many thinkers, namely, "the recognition by the Ego of its own operations," we should not be conscious of the printed letters which the sense enables us to perceive in reading a book; we should not even be conscious of the meanings read, for in this case we are not concerned with *ourselves*, but with the words and their meanings. Yet no one would dispute that words and interpretations were sensible affections and logical processes.

124. In reasoning we habitually pass from the major premiss to the conclusion, leaping over the minor premiss, which does not therefore rise into a conscious state. Was it or was it not in Consciousness? It certainly was an indispensable condition. But so long as an idea or a sensation is not discriminated, even if the fact of its operation be demonstrable, it is not a conscious state. The knowledge we have forgotten cannot be said to be a conscious state, yet it may be operative in determining our present perceptions and conceptions. In the development of Experience, processes which were at first unconscious in their operation and unprescient of their aim become by Reflection both conscious and prescient. On the contrary, in the development of the Will, processes which at first were conscious and tentative become motor-intuitions which are unconscious and automatic. The action which originally was guided by the co-operation of two or more senses now becomes so far independent of them that the muscular sense alone suffices. An organisation of experiences is constantly going on; when organised, each is apt to be undiscriminated, but even then it is a condition of sentient activity.

What place shall we assign such undiscriminated conditions? Wundt remarks that so long as a previously experienced feeling is not reproduced, and is therefore unconscious, it is only present as a *disposition*, which rests on a physiological disposition in the nerve-centres. But a mere disposition, psychological or physiological, is a fact of *structure* unless it is in operation; and Sentience is the activity of the sentient structure; so that when we are asked whether a disposition, which must be reckoned among the psychological conditions, or a modification of the nervous system which is its correlative, is a state of consciousness, we are in effect asking whether a fact of the organism is a fact of the activity of that organism. Potentially, no doubt, the organism is all it does; its action is only the organism viewed dynamically. Potentially, therefore, we may say that all the feelings which have passed beyond recall are in Consciousness, since they have modified the organism whose action is Consciousness. But when we speak of conscious states, we are speaking of actual not potential processes; and therefore only those conditions which can be shown or surmised to be in actual operation belong to the sentient activity, and of these, only such as are of the relative intensity implied in their being discriminated are conscious states.

125. The manifest advantage of thus restricting the term Conscious state to the activity which is salient and discriminated is that it extricates us from many contradictions and confusions. We know that the organism may be affected and changes take place in it, yet because of the simultaneous presence of

other changes we fail to discriminate them. Variations in the energy of stimulation must reach a definite degree of *relative* difference before they can be discriminated. Continuous increase of the stimulus may take place without any salient effect if finely graduated ; but there is a latent cumulative effect which on reaching a certain point becomes salient.

126. Hence we class the changes in the Sensorium under three heads of varying relative intensity, and call these *conscious*, *subconscious*, and *unconscious states.* The two first are admitted by all writers. The last are proved to have an equal claim, because we can show that one and the same sensible process and one and the same logical process may be effected under each of the three modes. The unconscious processes not only take place in the same organs, and under the same essential conditions, as the others, but are shown to have the cardinal character of sentient states by their influence in determining the succession and combination of ideas and actions. They have, or have had, the same conditions as the conscious and subconscious states.

A crowd of people is assembled at some interesting spectacle. The main direction of their consciousness is set towards the observation of what is going forward. Suddenly some one whistles. All of course are sensibly affected by the sound, but some are unconscious of hearing it, others are faintly conscious, giving but a fleeting attention to it, the next instant absorbed by the spectacle. There is, however, one in the crowd who, recognising in the sound a signal of great significance to him, is vividly conscious of it, and the whole current of his feeling is withdrawn from the spectacle. Obviously the sensible affection was substantially the same in all the hearers, but the relation it bore to the general sensorial state of each at the moment gave it its relative intensity.

127. Further, consider a symphony played by a full orchestra. Each of the various instruments has its quality, each co-operates, yet the orchestra is one instrument, not many. The mass of tone is the product of its component masses. We who listen have our consciousness fixed now by the agitating tumult of the stringed instruments, now by the sudden throb of the drums, now by the blare of the trumpets, and now by the shrill cries of the fifes; but while thus alternately detaching each we have a continuous consciousness of the resultant ensemble. It is thus also with our alternating consciousness of particular sensations and the continuous current of feeling. We are conscious of individual parts and conscious of a total. Each act of individualising is an act of attention, however fugitive; and because each stimulation has "a dying fall," an operant though latent energy, the individual parts are fused together, the discrete feelings become continuous, and a series which is a total is the result. When the orchestra is heard as an ensemble, the total effect overpowering its components, Attention is so vanishing as regards the particular instruments, that we are said not to be conscious of them, not to hear them. Obviously we did hear them, felt their influence, though unable to detach each from its companions. But even were it granted that we heard the ensemble and not its com-

ponents, this would not be an argument for excluding the unheard instruments from the musical class, and relegating them to the class of physical vibrations. Yet such is the argumentation of those who relegate unconscious neural processes to the sphere of physical phenomena, excluding them from the psychical sphere. The instrument—or the process—which you fail to discriminate when directing your attention to the total effect, may readily be detached from the rest by directing attention to it, or by some sudden change in its quality, or by the silence of the others.

128. The fundamental law of mental action is the Law of Grouping, which takes effect by a succession of integrations of sensible affections. There is first a grouping of neural tremors into a definite sensation; next a grouping of allied groups into perception; then a grouping of these into conception; then a grouping of these into judgments, and so on. The group or product of integration is a movement, a motive, or a conclusion. Now it is a significant fact that we are never conscious of the *formation* of any product, only of the *group formed*: the process of grouping is unconscious, the product fixes attention. A thought must be a completed process before it can be a conscious state. So indeed with all phenomena. The movement must be effected and appreciable space traversed before we are conscious of it. While the contractile tremors are rising up and passing into the muscular nerve they are preparing the feeling which the completed contraction will produce. Inductively we may know that in every perception there is a process of inference, in every conclusion there has been

an intuition of its premisses; but it is the perception and the conclusion alone of which we are conscious. No one, unless reflecting on the facts, is conscious that wood is hard or that horses kick; we all act on such conclusions.

129. So impressed have some psychologists been with the importance of unconscious processes in the explanation of mental phenomena, that but for their acceptance of the traditional definition of Psychology as "the science of the facts of Consciousness," it seems to me that they could hardly have fallen as they have done into the contradictions and confusions which beset this question. Many identify Consciousness with Memory. Professor Bain affirms that "we do not feel unless immediately afterwards we remember that we have felt." (*Notes to Mill's Analysis of the Mind*, i. 229.) But Memory may be best comprehended as a reinstatement of Feeling, and we know that feelings or perceptions, disguised from us under the immediate stimulus, may recur in Memory, not "immediately," but at some distance of time. We may admit that an impression is too faint or evanescent to leave behind it a recoverable trace; and such appears to be the case with a multitude of impressions which are only known to have been felt by their influence on the series of recoverable states, or by their forming components of a group. Professor Bain says it is "correct to draw a line between feeling and knowing that we feel." If so, why not draw a line between feeling and remembering that we have felt? In another work he has furnished what seems to me a good argument against this identification of Consciousness with Memory: "When

red and blue are first seen together, they give a start that fills the mind with an acute thrill of surprise. . . . At after times the same contrast is passed over with a comparatively faint excitement; the discrimination still remaining, and serving some purpose in our economy without rousing any shock of surprise. When red is reduced to the function of acting as a signal to perform one operation and blue another, the emotional excitement attending their original manifestation fades away to very narrow limits. The effect still occupies the mind or is a conscious effect, but so feebly and for so short a time as to be next thing to unconscious." (*Emotions and the Will*, 3d ed. p. 553.) On this, after first remarking that a sensation is a thrill, and a conscious sensation is a *dominant* thrill, I would ask whether our discrimination of red from blue is a thrill of such intensity and duration as to be ranged beside those which are designated as conscious? Do we always remember having discriminated these colours immediately afterwards? Is not the latent influence operant without need of its becoming salient? Sir W. Hamilton has mentioned the case of a row of billiard balls; when one is struck the impetus is transmitted through all the row, but only the last ball moves, the others remaining in their places. "Something like this," he says, "seems often to occur in a train of thought. One idea immediately suggests another into consciousness —the suggestion passing through one or more ideas which do not themselves rise into consciousness." Here it might be contended that all the balls were really moved, and all the ideas were really in consciousness, but that the oscillations were so rapid as to escape observation, and this would accord with the conception of Consciousness as co-extensive with Sentience; but if we understand by "Motion" appreciable change of place, and by "Consciousness" the salient state of Sentience, such as may be remembered, then the intermediate oscillations were not motions, the intermediate ideas were not conscious states.

130. This point,—now, I believe, first brought prominently forward, and therefore not to be considered as more than a suggestion to the student,—that we are not conscious of the formation of groups, but only of the formed groups, may throw light on a topic which has of late largely occupied psychologists, namely, the existence of unconscious judgments, unconscious reasonings, unconscious registrations of experience—which are the Logic of Feeling. The difficulty urged by many writers is no doubt a serious one. Mr. Mill states it, and answers it thus: "That a feeling should not be felt appears to me a contradiction both in words and in nature. But though a feeling cannot exist without being felt, the organic state which is the antecedent of it may exist, and the feeling itself not follow." This answer is open to criticism. In the first place, although there is a contradiction in words when a feeling is said to be unfelt, this is owing to an ambiguity which, when explained, removes the contradiction; the ambiguity is that feelings are mental states, and these states have sometimes the relative intensity which is that of consciousness, and are then said to be felt; and sometimes the relative intensity which is that of unconsciousness, and are then said to be unfelt. The

term Feeling is general in one sense, special in another.

131. The answer is still more unfortunate in its reference to the "organic state," as Mr Mill understands it. There are indeed organic states which are antecedents to feelings; the stimulation of the retina is antecedent to the sensation of colour, and may of course exist without the reaction which is the organic state understood to be the objective side of what subjectively is the sensation. But the "unfelt feeling," the unconscious sensation, is no organic antecedent, it is the organic state itself, which is a sentient state, but undiscriminated. We must not identify sensation with one of its conditions, but with all its conditions. With this explanation let us consider the following statements: "It frequently happens that certain of our sensations, or certain parts of the series of our thoughts, not being sufficiently pleasurable or painful to compel attention, and there being no motive for attending to them voluntarily, pass off without having been attended to; and not having received that artificial intensification, they are too slight and too fugitive to be remembered. We have often evidence that these sensations or ideas have been in the mind, because during their short passage they have called up other ideas by association. A good example is the case of reading from a book, when we must have perceived and recognised the visible letters and syllables, yet we retain a remembrance only of the sense which they conveyed. In such cases many psychologists think that the impressions have passed through the mind without our being conscious of them. But to have feelings

unconsciously, to have them without being aware, is something like a contradiction [*that* depends on the definitions]. All that we really know is, that we do not remember having had them; whence we reasonably conclude that if we had them we did not attend to them; and this inattention to our feelings is what seems here to be meant by our being unconscious of them. Either we had the sensations or other feelings without attending to them, and therefore immediately forgot them, or we in reality never had them. This last has been the opinion of some of the profoundest psychologists. Even in cases in which it is certain that we once had the feelings, and had them with a lively consciousness, yet when, through numberless repetitions, the process has become so rapid that we no longer remember having those sensations, these philosophers think that they are elided—that we cease to have them at all. The usual impressions are made on our organs by the written characters, and are transmitted to the brain, but these organic states, they think, pass away without having had time to excite the sensations corresponding to them, the chain of association being kept up by the organic states without need of the sensations. This was apparently the opinion of Hartley, and is distinctly that of Mr. Herbert Spencer. The conflicting suppositions are both consistent with the known facts of our mental nature. Which of them is true, our present knowledge does not, I think, enable us to decide." (*Notes to "Mill's Analysis,"* i. 231.)

132. An opinion entertained by men so eminent must have weight. The example cited by Mill seems

to point to the ambiguity of terms which sustains it. Clearly we must have *had* the sensations when reading the words, however obscure and fugitive these sensations may have been; we must have been sensibly affected by the signs which were interpreted, as all sensations are interpreted signs. But the attention was engrossed rather by the interpretation than by the signs; so that instead of our "fixing" the signs as we did when we first learned to read, we passed rapidly over them to fix their significations; and even this attention was fugitive, enduring just long enough to connect each interpretation with its successor. The letters were components of the word-groups, the words were components of the sentence-groups, the sentences components of the paragraph-group. Only the completed products were discriminated; but that each component was felt—*i.e.*, held its place in the sentient process—is evident. Any slight obstruction to the formation of such groups, any variation in the habitual collocation of signs, such as irregularity of type or spelling, incongruity of phrase, &c, would at once have called attention to the signs as sensations, and we should have become distinctly conscious of them.

On two grounds, therefore, it may be concluded that we must have had these sensations and ideas in spite of their being unconscious states: First, because it is certain that we had the organic states which are their physiological conditions of production, and these cannot exist without sensations and ideas (the products), for causes necessarily involve effects. Secondly, because while reading we from time to time did become conscious of the organic states, and must always become so when attention is by any means directed towards them.

133. That we forget feelings immediately they have passed is not an argument against their having been felt. We forget myriads of feelings, even energetic feelings, experienced a year ago, a week ago, an hour ago. Some which passed but a minute ago—visceral sensations, sights, sounds, touches—are beyond recall. Who will say that these were organic states but not feelings? To be conscious of performing an act, and to be conscious of having performed it, are two different mental states; and although the latter is impossible unless the former have taken place, the former may easily take place without the latter. This has been overlooked by writers who declare that certain acts performed during an attack of epilepsy or insanity were *performed unconsciously*, and are therefore to be relegated to the mechanical conditions. There is no evidence that the acts were performed unconsciously—all the evidence is against it—but only that afterwards the agent has no consciousness of having performed them. He cannot *re*-feel what he felt. Every spectator of those acts must have seen that they were such as could only have been performed by a sentient being who discriminated many of his sentient states with precision. That the *remote* consequences of his acts were not vividly present to his consciousness may be admitted; but this is equally true of many acts performed by the sane and healthy. Consider the following case:—

Trousseau had among his patients a magistrate, who one day, while presiding at a trial, rose, muttered a few unintelligible words, and walked deliberately into the adjoining room. The usher followed, and saw him make water in the corner, then return into court and resume an intelligent hearing of the trial. When informed of what he had done, he was perfectly incapable of recalling it. But although he was not conscious of the veritable relations of his surroundings, he had a consciousness of those which he imaginatively substituted for them; he was assuredly guided in his actions by sensations and ideas of which he was perfectly conscious, incongruous as these may have been. Trousseau also had a patient who was liable to strange impulses, prompting her to use odd expressions, witty and pointed sarcasms, so apposite that all present believed them to be intentionally uttered; but of these she was "quite unconscious." (*Lectures on Clinical Medicine*, i. 25, 26.)

134. Students of mental Pathology are familiar with many such cases. In one and all it is evident that the so-called unconsciousness is one of three things: 1°, a non-representation of the *remote* consequences of the actions; 2°, the substitution of some illusory representation; or, 3°, the forgetfulness of what has passed. In one and all it is evident that sensible impressions excited perceptions, and that logical combinations directed the movements towards a foreseen end. Had the magistrate and the lady just mentioned committed crimes instead of improprieties, few persons would have judged them to have been unconscious. Want of representation of remote consequences is that which characterises the criminal mind; illusory representation will cause crimes, but the actor is then absolved from moral responsibility.

135. The laxity of the term "unconsciousness" is conspicuous in the frequent application of it as the synonym of painlessness and forgetfulness. Thus patients under chloroform are said to be unconscious, though giving many unmistakable signs of sensibility. They are said to be so because on awaking they declare they felt no pain under the operation. But they can recall some of their sensations, and often recall their dreams. Dr. Richet assures us that when he had a tooth drawn he distinctly felt the contact of the instrument and heard what was said; but of pain he felt nothing. He assisted Verneuil in an operation on a lady. While it was going on he asked her age; she replied, "Forty-one." But no symptom of pain was manifest, and when she awoke she complained that the promised operation had not been performed. She was therefore conscious of the question put to her, but not of the knife entering her flesh: one form of sentience was in abeyance, other forms were active. Another of Richet's patients during a very serious operation exclaimed, "Don't tickle my nose!" when his nose was accidentally touched; but the knife produced no shrinking, no cry. Another patient heard the clock strike, and exclaimed, "That's half-past eleven." * Even when the narcotism is so profound that no such manifestations of sensibility are observed, there are other manifestations in reflex actions which prove that it is not wholly absent. My contention is that so long as the sentient mechanism is in action at all, so long there is Sentience; and that what we call Consciousness is like what we call Pain,

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* RICHET: *Recherches sur la Sensibilité*, 1877, p. 259. I have given other examples in the *Physical Basis of Mind.*

a special form of Sentience, having gradations of infinite variety.

136. Returning now to the misconception of organic states in relation to sensations which Mill seems to have adopted, and which greatly obscures the present question, let us approach it first on the psychological side. Many ingenious attempts have been made to explain the fact that several links in a chain of reasoning never emerge into the distinctness of conscious states. Some suggest that the ideas of which we are not conscious do actually pass through the mind, for were the links not present the chain would not be present; they are, however, so faint and transient, that we do not attend to them at the moment, and cannot recall them afterwards. Others suggest that the ideas never were present, but were "overleaped and pressed out by the rush of subsequent ideas."

There are two psychological laws which suffice to explain the facts. The first is the formation of intuitions, the second is the substitution of signs. When once a neural group, however complex, has been formed, it operates like a simple unit, and enters as such into the combination of other groups. A further extension of this is seen in the association of different organs, which, originally acting independently, have been brought into such convergence by intermediate links that they now coalesce and act together without the need of such intermediation. Thus the combination of visual and tactual sensations is needed for the formation of an intuition of form and size of an object; but these having coalesced, and the intuition being effected, we no longer need the intermediate processes, we no longer need to handle the object seen, nor to see the object handled, before we decide upon its size and form, solidity and colour. By a slow initiation we learn the relations of the addition and multiplication tables before we can tell, without counting, how many ten added to five will make; but afterwards the intuition of $10+5=15$ is given in the juxtaposition of the terms. The expert analyst familiar with equations decides questions by intuition of the relations which to another would require many intermediate operations.

137. It is therefore easy for the mind to pass rapidly over many links in a chain of reasoning without pausing to interpret them, without being conscious of their presence. All that is implicit need not be explicit. And here the law of substitution comes into play. Sensations become images, and these fainter feelings serve as substitutes, determining conclusions or actions just as the sensations would. These images may be replaced by signs which have no trace of the sensations signified; so that the words "horse" and "virtue," although awakening no image of horses or virtuous actions, operate quite as effectually as the images. It is not that the ideas are "overleaped and pressed out," but that a *substitution* has taken place, and the verbal feeling operates in lieu of the visual and tactual experiences it condenses.

138. When, therefore, the question is asked whether these non-interpreted feelings were or were not in Consciousness; the answer will run somewhat thus: They were *represented* in Consciousness by actual operations—discriminated or not—and were psychical

conditions, without which the processes would not have taken place; but they were not the mental states nor the organic states actually in *operation*, and in *this* sense the non-interpreted feelings were neither conscious states, nor in Consciousness. A man has money in his pocket, money in the bank, and money lent or invested. His property comprises all three; though, since much of the money lent and invested is not easily available, and some of it may never be recovered, this may be said to lie outside his actual property. It is thus with his experience. Much of it lies quietly in the bank of Memory, and may easily be called upon; much of it is invested, and cannot easily be laid hold of; much of it is irrecoverable "bad debt." His opinions are influenced by this irrecoverable experience, as his expenditure by his irrecoverable debts. He knows more than he can prove.

139. This illustration may help us to approach the physiological side of the present question. Mill and many others think that the explanation of the dropped links in a chain of reasoning is that the organic states which are the antecedent of feelings are present without their consequent effects, and these are the unconscious states. Conceiving the neural process or organic state, not as the objective side of that which on the subjective side is the mental process,—conceiving it as an antecedent which has to be *transformed* (somewhere) into a feeling when, and only when, it becomes a state of Consciousness, they plausibly contend that such an organic state may operate without the transformation, and may determine an action or some other feeling. In this view

we might say, that just as a remembered sensation, although much fainter than the sensation itself, has a similar effect in determining actions, so the organic state may have its energy abated and produce no sensation, yet have energy enough to determine action. In each of the three cases, sensation, image, and organic state, there was a neural process operating, and as this is the one indispensable condition, it will suffice where there is no sensation, no image.

140. I have stated the position in the strongest way in my power, and now proceed to attack it. There is a double ambiguity: first, the term organic state is used as an antecedent to the mental state, as if it were something independent of it, which might or might not have the mental state as a consequence; secondly, the term Feeling is restricted to discriminated states. In our analysis we often fix attention solely on one stage in the neural process—say, the impression on a sensory organ—and so come to confound this with the whole of the completed process of stimulation and reaction, which is the organic state, the equivalent of the mental state. If this be rectified, we shall see no ambiguity in using indifferently the term brain or mind, organic state or feeling. But hereby the supposition of organic states in operation unaccompanied by their correspondent mental states is excluded. In the cases of *substitution* just mentioned, there were assuredly not the organic states in operation which are equivalent to the sensations or images *represented*—the feelings being absent, *their* organic states were absent—but there were other organic states in operation, which were the equivalent of the *representative signs*. The words "horse" and

"virtue" have their correspondent organic states; but in the word "horse" the compound of auditory and articulatory states are not the visual and tactual states corresponding with the perception or image of a horse—they are *substituted* states. The bank-note which represents five golden sovereigns and a hundred silver shillings—which is the substituted sign of these coins, and which may be exchanged for them—has not the same metallic structure, but it has a very definite structure of its own. It is money, though it is not gold or silver. It is a commercial instrument in one view of it, a bit of paper in another. If we limit our definition of money to metallic currency, the bank-note is not money. If we limit our definition of Consciousness to discriminated states of Sentience, the undiscriminated processes are not included in it. But if we say that the bank-note is money because it is the equivalent of money, and has the same commercial value as coin, we must say that all undiscriminated processes in the sentient organism are psychical when they are the equivalents of discriminated processes, and can become discriminated.

141. The lines of circumscription are of course somewhat arbitrary; but following the ordinary artifices of Science, we can fix on certain demarcations. Thus, referring to our previous illustration of the multitude of instruments simultaneously co-operating in an orchestral symphony, it is obvious that each instrument while sounding is a component of the total effect, although the hearer may be wholly unable to detect it, and each instrument may be heard if some of the others are silenced. Each was,

therefore, a condition of the musical result, and falls under the musical category. But the movements of the players were also conditions—indispensable conditions. They are not, however, included under the musical category. Why? Because in themselves they are animal actions, but not such as affect the auditory sense. No silencing of some instruments will make these *movements* audible. They never were, they never can be, sonorous phenomena. The parallel is evident. All those processes in the neuro-muscular system which *have* had and *may* have correlative feelings are sentient processes, and belong to the psychical category. But the many organic processes which are indispensable conditions to the production of neuro-muscular sentient processes are excluded: these are the only "antecedents" of which it is correct to speak, and these are never mental states. Molecular changes in brain and spinal cord are simply molecular changes on a par with those which take place in every tissue; they are *vital* changes only when brain and cord are parts of a living organism, and *sentient* changes only when the Sensorium is in vital activity.

142. How, it may be asked, can we decide whether a sentient state has been produced by stimulation unless it has been discriminated, unless it has aroused Consciousness? There are several indications that a state which is a process in the sentient organism will only become salient according to its relative intensity —by which I mean the degree of *difference* rather than the degree of *energy*. Suppress the action of the external senses, and the visceral sensations at once become salient, as a ticking clock is heard when

the gong is silenced, or when we cease to meditate a problem. The existence of sentient states that are not salient, not discriminated, is therefore proved in various ways. Unconsciousness of a process is often an acquired incapacity of attention. Our perceptions of distance both by eye and ear are due to an inferential process of which we are now wholly unconscious; we only know by induction that it must have taken place. We have an acquired incapacity of attending to this process because it is now no longer a reproduction of the original elements, but of their *substituted group:* the intuition has taken the place of the original sensible impressions. No adult endeavours to grasp the moon. His intuition of the impossibility was slowly formed out of myriads of experiences; but although he can render his judgment explicit, and state the reasons why he does not attempt to grasp the moon, such reasons are only implied in his ordinary judgment, and of them he is not conscious.

143. It has been said that when an expert calculator adds up a long column of figures by a mere glance at them, this is "unconscious cerebration;" the brain is said to operate without the "organ of consciousness" intervening; one proof being that there is not time enough for every figure to excite a distinct act of consciousness. The fact that the calculator was not distinctly conscious of each figure—meaning by this that he had not a full realisation of its individual value, seeing five units in the figure 5, and so on—may be admitted; but those who rely on "unconscious cerebration" as evidence of mental processes effected without Sentience

seem to me to err. The calculator was demonstrably sentient of the sensible signs which he logically interpreted in the normal way; only, just as the ordinary reckoner has ceased to translate 5 into .˙.˙. and passes on at once from the signs 5 + 7 to 12, so the expert includes a longer succession of signs with a rapidity which seems like an instantaneous embrace. In the same way we annex with the quickness of a flash the visual appearances of an object in the motor-intuition which guides our effort to reach it.

144. Even were it granted that the undiscriminated unconscious states were also insentient, they would still, by virtue of their connections, belong to the psychical class, and as such take their position in our science, not be relegated to the "merely mechanical" class. But I fail to see any ground whatever for denying that a process which avowedly takes place in the sentient organism, and which once was separately felt, ceases to be a sentient process when it has become so blended with others, or masked by others, as to be inseparable from them. We have good grounds for distinguishing some states from others by their greater relative intensity; but when intense luminousness passes by gradations to faint luminousness, and from that to darkness, we do not therefore conclude that the sensation of darkness has ceased to be optical.

145. Mr. Spencer, indeed, has ingeniously argued that as tendencies become organised they drop from the psychical to the physical sphere, and conversely that Memory, Will, Reason, nay Feeling itself, come into existence when the involved connections between

the states render their successions imperfectly automatic — "these so-called faculties are classes of psychical states which are in process of being organised, and disappear when their organisation is complete." But is this the relation of physical and psychical? *Physical* either means the objective bodily aspect of the psychical phenomena, or it means phenomena of the inorganic class. In the first sense, psychical states, whether succeeding each other regularly or irregularly, must always have their physical correlates. There is no mental change which is not at the same time a physical change. But just as an action does not cease to be a vital action on becoming automatic, so a mental process does not cease to be mental on becoming organised. One may say that as the organisation of the body becomes complete its actions tend to become more and more easy and automatic; and as the organisation of mental processes becomes complete they also tend to become more easy and automatic, in consequence of which they do not in their passage drag with them an escort of nascent feelings; they are not sufficiently enduring or sufficiently intense to fix attention, and are thus subconscious or unconscious. But this is only relative. Mr. Spencer says, "Between the reception of certain impressions and the performance of certain appropriate motions there is some inner connection. If the inner connection is organised, the action is of the reflex order, either simple or compound, *and none of the phenomena of consciousness proper exist.* If the inner connection is not organised, then the psychical changes which come between the impressions and the motion are conscious ones."

(*Psychology,* i. 496.) This is clearly stated, and is the logical conclusion of his premisses; how does it bear the light of facts?

146. The sentient organism is affected and reacts, whether the inner connection be organised or not, whether the motion succeed the impression rapidly and invariably, or slowly and uncertainly. To say that none of the phenomena proper to Consciousness exist in the first case, is simply assigning to Consciousness the position of a special Mode of Sentience. This is acceptable; but it does not throw the unconscious processes into the sphere of insentient physical processes. And Mr. Spencer's assignment of Consciousness to the non-organisation of the inner connection is untenable in presence of the facts that such inner connections may be perfectly organised and the actions automatic, so that the movement follows the impression in spite of all our efforts to arrest it, while, nevertheless, we are very often distinctly conscious of them. There is no more perfectly organised connection than that between impressions on the conjunctiva and winking, or impressions on the respiratory nerves and breathing; and generally these typical reflex actions are unconscious. But they are not only always sentient, they are also very often discriminated; we are often as conscious of the processes as of any in which the inner connections are imperfectly organised. Nor is it correct to say that a fully established reflex action is unconscious because it is not delayed in its course, and hence does not "occupy the time which consciousness implies." For although it is true that unless the molecular change occupies a certain time it is not discriminated—does

not establish the needed difference of state, yet on many grounds we may show that mere *duration* is not, whereas *difference* of state is, the essential factor. Apart from this, the fact is that winking or breathing is *not* more rapid when unconsciously than when consciously effected.

While, therefore, the facts are against Mr. Spencer's hypothesis in regard to the physiological reflexes, they are not less so in regard to psychological integrations. Logical processes of inference and combinations of widely different premisses are effected with the rapidity, the invariability, and the unconsciousness of reflex actions. Are they also on this ground to be regarded as having lapsed from the psychical to the physical sphere? Are they also to be excluded from the facts of Sentience? Like the reflex actions, they may be unconsciously or consciously effected; and this is entirely a matter of their relative intensity in the system of forces at the moment.

147. Although in the preceding observations we have endeavoured to show that every neural process in the Sensorium is a sentient process, and therefore that the cases of links dropped out of a chain of thought are improperly assigned to organic states which were merely antecedents and not mental states, we must not be understood to mean that the fact of dropped links is impossible or infrequent. Very little reflection shows that intermediate feelings and thoughts, like the suppressed premisses of a conclusion, are often absent from Consciousness, and are probably absent from Sentience, in which case there is no neural process in action corresponding to such

feelings and thoughts. This is not a case of substitution, but a real overleaping of intermediates. We begin to hum a melody, and, after a bar or two, pass at once to the conclusion; we begin by narrating an event, and omitting or forgetting the insignificant details of its intermediate stages, mention only the close. In such cases the dropped links have not been present as neural processes, but because the processes were originally active they have left their structural dispositions, and these determine the succession of organic states. Sometimes these residua have been faintly stirred; and we know that a very faint excitation of one element in a group is often enough to awaken the activity of other elements. Sir Henry Holland has noticed how the mere imagination of an impression about to be produced will excite sympathetic sensations "and movements in other parts which are wont to be affected by such impressions." He cites one of his patients "in whom the mere expectation of any hard pressure of the hand or sudden jar of the body instantly creates uneasiness approaching to momentary pain in the perineum; this particular effect in greater degree invariably following actual jar or pressure." (*Chapters on Mental Physiology*, 1852, p. 38.) And Dr. Bennett tells of a magistrate who felt faint owing to the odour of decomposition coming from the coffin in which the body of a murdered child was *supposed* to be. He was forced to leave the room by this faintness; yet when the coffin was opened it was empty. These are but exaggerated examples of the recall by association. The conclusion must have been associated with its premisses—the closing bars with the opening bars of a melody—the final stages with the opening stages of the event, before the intermediates could be suppressed, the links dropped.

148. The very great importance of this question must be my excuse for dwelling on it at such length. Accepting the argument of the foregoing pages, that unconscious sentient processes must be placed beside subconscious and conscious processes among the data of psychology, we shall have no difficulty in answering the questions asked at the outset. The first, whether Consciousness is co-extensive with Sentience, we answer thus: General usage, which alternately implies both that it is and is not co-extensive with Sentience, may be respected by our understanding that a conscious state is a special state, one that is discriminated by its relative intensity from all simultaneous states, and that Consciousness is the abstract term for all states, whether discriminated or not. In the first case, to have a sensation and to be conscious of having it, are two different states; in the second case, they are one and the same state. Whatever ambiguity there may be in this must be submitted to as inevitable. Language was not formed by philosophers. They must employ the terms at hand.

149. Herein we have given our answer to the other questions, whether Consciousness is the superaddition of an activity in a special organ or spiritual entity, which may or may not co-operate with the sentient process in any particular case; and whether Consciousness is only a phenomenal distinction. Hence all that remains for us is to specify the conditions of the distinction.

Consciousness, as the abstract of discriminated states, is that which writers indicate when they say it is *impressed* by objects, ideas *emerge* in it, images are *presented* to it, and it is *directed* to them. Sir W. Hamilton defines it, "the recognition by the mind or the Ego of its own acts or affections." Dugald Stewart defines it, "the immediate knowledge which the mind has of its sensations and thoughts, and in general of all its present operations." Here Consciousness is not co-extensive with Mind, but is only one of its modes. And even thus understood it fails to justify such phrases as "the cat is conscious of the presence of its prey," and "man is conscious of the existence of an external world;" for in these there is no recognition by the Ego of its own operation. Elsewhere Hamilton escapes this contradiction by a different definition. "Consciousness," he says, "is not to be regarded as aught different from the mental modes or movements themselves." This is to identify it with Sentience, which includes unconscious states, and accordingly we find him reviving the Leibnitzian doctrine of unconscious mental modifications. I am not clear as to the position of Professor Bain, for while, on the one hand, he gives a definition which identifies Consciousness with Sentience—"co-extensive with mental life, and stated more or less strongly as that life is considered to rise or fall in degree" (*The Emotions*, p. 545)—on the other hand he excludes from mental life the sentient states and mental operations which pass unconsciously, regarding them as reflex and insentient.

150. Consciousness is often synonymous with Cognition. To have a sensation and to know it is to

be conscious of it. But the term Cognition is also ambiguous. A dog is said to know his master, and to know that he will be beaten if he does this or that; and such use of the term is as accurate as its application to the highest forms of Cognition. The dog also recognises his kennel, knows his food. Is he conscious of these? Yes, if Consciousness be discriminated feeling; no, if it be recognition by the Ego of its own operations. Much of our own knowledge — even scientific knowledge — is in this sense quite unconscious. Professor Bain has referred to Newton's *Principia*, where there is evidence that his mind passed so rapidly over the intermediate reasonings that it is doubtful whether he could himself have expressed these unless by a deliberate effort and long meditation.

151. We discriminate feelings of Sense, feelings of Intellect, and feelings of Volition. They are severally Sense-consciousness, Thought-consciousness, and Volitional-consciousness. The two factors, Feeling and Discrimination, are thus the factors of Consciousness when that is the synonym of Cognition. But as Feeling, in its widest acceptation, is also Consciousness in its widest acceptation, what is that special mode or quality which is designated as Discrimination? It is relative intensity, the momentary predominance of one thrill over all the simultaneous thrills to which the sentient organism is subjected. The conditions of this predominance are complex. They may be summed up in the *greater energy or dissimilarity* of the stimulation, with the consequent arrest of Attention.

152. Although philosophical and ordinary language

agree in identifying Consciousness with Attention, so that to be conscious of a feeling is to attend to it, to be unconscious is to be inattentive, this is only rebaptizing a process, not explaining it. We must therefore inquire—

WHAT IS THE OPERATION IN ATTENTION?

153. Note, first, that Attention is not a faculty, as so many psychologists suppose, and as our ordinary language seems to indicate when we say it is directed or arrested, or when we treat it as an internal contemplator of mental and physical changes. Considered on its active side, it is one of the phenomena of the Reflex Function; on its sentient side it is a measure of intensity. Every act of attending is a reflex act. But since we recognise a distinction between involuntary and voluntary reflexes, we must extend this to involuntary and voluntary attention. It is the latter which usurps the name; just as Vision is commonly restricted to the focussing which brings the object to cover the yellow spot of the retina, because there Vision is distinct, although the whole of the retina is sensitive in varying gradations. Objects impressing the retina on the outer zones are indirectly, indistinctly seen. This indirect, indistinct vision is a typical example of *subconsciousness.* It forms the larger portion of the visual field, in which various objects are seen with varying distinctness, whereas only those which cover the yellow spot determine the convergence of the optical axes, and are hence distinctly seen. The influence of these subconscious states in determining results is immense.

Confining ourselves for a moment to the case of vision, our Orientation or localising greatly depends on the impressions outside the yellow spot. Aubert says that if the eyes are covered, with the exception of a small hole in the centre, a man is unable to find his way even in his own room; and patients suffering from atrophy of the outer zones of the retina, with a consequent limitation of the visual field, walk very unsteadily, and easily fall. (*Physiologische Optik.* 1876, p. 485.) This is intelligible when we reflect how the ground, the sky, the houses, &c., are taken into our glance as we walk, though none of these may be fixed, or only momently fixed.

154. The analogy between Consciousness and the yellow spot of distinct vision has been noticed by several writers. We have only to extend the analogy, and the whole of the visual field, with its incessant and infinite gradations of distinctness, will analogically stand for the gradations of sentience, broadly marked as Consciousness, Subconsciousness, Unconsciousness. So long as the retina is anywhere affected there is vision, or the components of a visual perception; so long as the Sensorium is affected there is feeling, or the conditions of some mental change.

Attention, then, is *mental focussing*, with consequent distinctness of vision. Limited to a certain group of sensitive tremors, it thereby excludes all other groups. The eye moves incessantly, bringing the yellow spot successively in relation to different points in the visual field; each movement is a reflex produced by the urgency of the strongest stimulation. Having fixed one point, the eye moves to another, for it cannot remain fixed more than an instant, except by great effort; it seeks the brightest point, because that is the strongest stimulus, but it also is determined by another kind of stronger stimulus, namely, *interest.* By rapid oscillations and alternations the eye traverses and retraverses the visual field. There is a strict analogy between this and the fluctuation of intensity in the sensorial field: one stimulation rises into distinctness after the other; the rise of the one is the fall of the others. There is, however, no faculty of Attention determining this rise and fall; that is only the name we give the process.

155. Every one is aware that what is called directing the attention to a process, or a part of the body, suffices to raise the sensation from the indistinctness of unconsciousness and subconsciousness into the clear light of consciousness. At any given moment you are unconscious of feelings in your finger-tips and toes, nay, unconscious of having those parts; a momentary attention suffices to raise a vivid consciousness of fingers and toes. Were these feelings non-existent, even as items in the general stimulation of the Sensorium, and only called into existence by an increased innervation of the parts consequent on the act of attention? Or were they existent, but obscured by the predominance of other stimulations? It is not improbable that an increased innervation played its part, since we know that keeping attention fixedly on any organ increases the flow of blood there; but it is certain that, unless some sensation were already there, no effort of attention could evoke it; and this may easily be proved by fixing the attention on some insensitive part.

156. As with sensations so with thoughts. We can attend to thoughts, keep them fixed and recurrent, but before we can fix them they must rise; the cerebral conditions must be present before we can arrest them; our attention is the energy of interest which gives each thought its predominant stimulation, and thereby suppresses the rise of other and incongruous thoughts. In the state known as Expectation the Sensorium is adjusted to the reception of a particular group of impressions: the organism is, so to speak, "ready to spring," having prepared its organs for that reaction; and this condition is itself a suppression of all nascent impulses which, tending towards a different reaction, are not congruous with the adjustment: when such impulses arise they are speedily suppressed. A man expecting the appearance of his enemy or the solution of a problem is irritated, disturbed, by any call on his attention elsewhere. If told to look elsewhere, he is satisfied by a rapid glance, and returns to his former state; if an irrelevant idea is suggested, he quickly dismisses it. Whereas, if, instead of being called away, he is told to look in the expected direction—if, instead of an irrelevant idea, there rises a relevant idea—his adjustment becomes more tense, and his readiness to spring is increased.

157. It is thus that Attention is a volitional reflex. This is especially noticeable in Observation. We are not simply receptive and passive in observing, but also active, detaching one set of impressions from many that are simultaneous. Systematic observation is an intellectual process of a high order, very different from *seeing*. It directs the current of impres

sions according to some preconceived purpose, and directs attention to the impressions themselves rather than to their interpretations. What is this process of direction? It is the bringing of the organs into those positions which are most favourable to the reception of stimuli. To see distinctly we converge the axes of both eyes and accommodate the lenses, at the same time disregarding the impressions made on the outer zones of the retina. To hear distinctly we adjust the aural muscles, and disregard all sounds not relevant to the series we wish to follow, as when in the hubbub of the market-place we follow only one speaker's voice. To observe mentally we fix in the same way one series of feelings, and disregard all those not congruent with the series. There is more or less sense of Effort in this act, and by it we become conscious of the act.* Is this a distinction between Consciousness and Attention? No; it is simply the attention to the peculiar sensation which accompanies the innervation of the attending organs. This innervation, like all others, may be distinctly or indistinctly felt at different times. The effort is distinctly felt when we endeavour to combine two ideas which are difficult or incapable of combination; it is not distinctly felt when the ideas easily blend. The fatigue of thought is analogous to muscular fatigue; and when the effort of suppressing irrelevant ideas is great, there is a muscular effect traceable in the temporary arrest of respiration.†

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* Compare WUNDT: *Physiologische Psychologie*, 721, and FECHNER: *Psycophysik*, ii. 453.

† This physiological influence has rarely been allowed for. Every one knows that the breathing is suspended during fixed attention; and that the yawning consequent on sustained efforts of attention is probably

159. Attention being thus a reflex, we understand why it can only be excited and sustained by stimulation. The mere desire to converge the axes of the eyes is insufficient, there must be the stimulation of an object to fix them. The mere prescription to attend to a certain topic is powerless unless there be an *interest* to fix it. Gall well said, in answer to Vicq d'Azir, that it is idle to attribute the want of attention in monkeys to their natural turbulence: show a monkey his female or a fruit, and he is attentive enough.

In the rapid alternation of feelings, the oscillations of attention, only those which have the greater relative intensity will be conscious states; those of less intensity subconscious; those of minimum intensity, unconscious:—*i.e.*, attention, fugitive attention, and inattention represent the three marked divisions of our mental states.

160. As Experience develops we acquire a greater capacity of Attention in general, and also of attending to, *i.e.*, distinguishing, sensations which were previously confused with others. The painter acquires a sensibility to colour and shades of colour, and the musician a sensibility to tones, which transcends that of ordinary men. The mathematician acquires the sensibility to geometrical relations from his constant attention to geometrical forms.

And with this increase in the capacity of Attention there also comes an acquired *incapacity* of attending

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the effect of diminished respiration. The acquisition of the power of attention is the learning how to alternate mental adjustments with the rhythmic movements of respiration. It is a happy phrase by which the French indicate a quick but superficial thinker as incapable of a work *de longue haleine.*

to certain sensations and movements which formerly were distinguished. In some cases the incapacity is absolute, that is to say, we cannot, if we try, become conscious of the state, when it has lapsed from the position of a discharging group, and become only the elementary component of some wider group. In most cases it is relative. Thus the din of the millwheel, which prevents my hearing what the miller says, has become so familiar to him that he has an acquired incapacity of attending to the sounds, and amid the whirl he perfectly hears all I say. But the incapacity is not absolute: let there be only a creak, or any other unfamiliar sound produced by the wheel, and he will be the first to distinguish it. As it is interest which fixes the attention, so it is want of interest which incapacitates the attention. The miller knows what the sounds mean, and has no interest even in that knowledge. How an explanation—be it merely a phrase—quiets the mind, withdrawing it from further efforts of search, may often be noticed. A patient agitated by certain unfamiliar symptoms is often quieted by the assurance of his physician that these symptoms "proceed from the nerves." He has no knowledge of nerves, no conception of how his symptoms are connected with them, but the phrase itself is familiar, and therefore unagitating: it calms him.

161. M. Delbœuf relates that having paid a visit to a country house which was near a waterfall, the noise of the fall at first almost prevented his hearing the conversation at table; he gradually got accustomed not to attend to it, and on the sixth day, on awaking during the night, he could not hear it at all. In vain

he listened, no sound was heard. He got out of bed, and on going to the window the sight of the falling water first made the fall audible. (*De la Sensibilité*, p. 38.) This curious case, analogous to the insensibility of the miller to the roar of the mill, shows how a powerful sensible affection may fail to become a sensation simply because the Attention is not excited, and how this failure of attention comes from the cessation of significance: the novel sounds irresistibly attract notice by a diffused escort of nascent feelings; this escort becomes more and more restricted by repetition; and finally the organism gets so adapted to the uniformity of the stimulation that it ceases to respond by a reflex of attention. Yet the co-operation of another sense, by recalling the state of feeling associated with the sound, suffices for the revival of the whole process by which the sound is felt.

The incapacity of attending to a feeling may be due to the presence of some more powerful stimulation, or to the organism having acquired some definite mode of reaction: thus we are unable to see the plainest evidence (plain to others) when it opposes our passions or deep-rooted convictions. So far from its being marvellous that men of vast intellects should fail to see what to other men are self-evident truths, it is only a case of the general incapacity of the mind for seeing what does not interest it, and of combining ideas that are antagonistic.

162. In treating of psychological Method we had to remark on the difficulty of Observation. Our present investigation throws light on that subject. The acquired incapacity of attention is the cause why the greater part of what passes for Observation,

except in science, is extremely fugitive and imperfect, because the mind necessarily hurries on to Interpretation. When we look at a landscape or read a book, we pay but a fugitive attention to the sensible affections, unless we are painters or printers; and we are absolutely incapable of attending to the logical processes of combination on which an interpretation depends. Hence the animal, the infant, and the uncultivated man observe but little, that is to say, they pay slight and fleeting attention to the sensible qualities of the objects as such, being predominantly attracted by what the objects signify; it is their interpretation of the sensible signs which interests them and directs their actions. The colours and forms of things have for the artist and man of science an interest which fixes attention; to the ordinary mind they are only the recognisable signs of objects which serve some needs. The play of light, the gradations of tint on an apple or a mossy wall, which arrest and delight the artistic eye, are to the ordinary beholder simply signs of apple and wall, and in themselves have no interest for him.

163. It is this tendency to pass from signs to their significations which early causes us to become so inattentive to the internal changes operating in perception, and so attentive to the external changes preceding them, that we come to regard colours, forms, sounds, scents, and emotions as properties exclusively belonging to things, and not at all as the affections of our Sensibility determined by the action of things. Only by study do we arrive at a vague conception of our subjective co-operation in the perception of objects. Even when experiment and

induction make us aware of the fact, our acquired incapacity of attention to the process makes it extremely difficult to keep the fact before us. Colours, forms, and motions imperiously assert themselves as external forces, which we suppose ourselves passively to receive, as a mirror receives the images it reflects. Even more difficult is it for us to realise that the true agencies in the perception of colours, forms, and motions are changes in our nervous system. The whipped dog feels the pain, but he no more refers this pain to internal changes than the ordinary man refers the colour and motions of the whip to internal changes. The dog, indeed, connects the painful feeling with certain visual feelings, and believes the pain to be something belonging to the whip, as we believe the heat to be something belonging to the fire. When first the dog felt a pain his attention was probably wholly occupied with this feeling, without any objective interpretation which could project it outside by connecting it with some visible antecedent; but having learned that some pains were concurrent with certain visual appearances, and were relieved by certain muscular efforts which changed his relative position to such appearances, he soon learned to connect these pains with these appearances. It is thus also with us. And only by reflecting on our experiences do we learn to refer the pain to a change in ourselves.

164. We have now brought our discussion to a point from which a survey may be taken. We have seen that a conscious state is one which is discriminated by its relative intensity from all other simul-

taneous affections of the Sensorium; and it is this *difference* which characterises it, not any addition from some other organ: the neural process itself takes place in the same way whether it be a conscious, subconscious, or unconscious action of the Sensorium. In inquiring into the conditions of this difference we found that the conscious state was the act of attention, the unconscious state one of inattention. This is the psychological process, and its physiological correlative we found to be a reflex act. But little seems gained thereby, since all sensations have their reflexes, and our task was to specify the conditions which determined one reflex amid several as the reflex of discrimination. A clue seemed to be afforded by the facts of vision. While the whole of the retinal surface is sensitive to light and all objects in the visual field are perceived, only one spot in the retina is capable of distinct vision, and it is the impressions on that spot which by their greater vividness obscure the impressions on other spots. When any impression on the outer zones of the retina has sufficient energy, it causes a reflex which brings the yellow spot to bear on the object, and thus enables us to see it distinctly. But there had been an act of discrimination, a reflex, which preceded this, namely, the act of attention to the indistinct object. Helmholtz has proved that we can by attention suppress the effect of the impression made on the yellow spot, and thus become conscious of impressions on the outer zones. This shows that the process is sensorial, and not retinal. It disproves also Wundt's opinion that the visual field (*Blickfeld*) is the field of Consciousness, the visual point (*Blickpunkt*) the seat of Attention; though this opinion is acceptable if by Consciousness we understand sentience in general, and by Attention only the highest degree of discriminated sentience, with lower degrees of subconsciousness and unconsciousness corresponding with fugitive attention and inattention. As a physiological fact, it is only impressions on the yellow spot which by their greater energy determine the predominance and consequently the attention or consciousness; but, as a psychological fact, the attention or consciousness may be determined by impressions of feebler energy but of greater interest, and that depends on the psychostatical condition or psychical tone of the moment. There is therefore, and it is a truth which has not escaped Wundt, an inner or sensorial visual point (*Blickpunkt*) which dominates that of the retinal point. I shall return to this presently.

165. Our final explanation then is this: Consciousness in its *widest sense* is Sentience, the activity of the sentient organism, and includes activities that are unattended to, activities that are but faintly and fugitively attended to, and activities that are distinctly and enduringly attended to. In its *narrow sense, and the one commonly in use in philosophic speech*, it is that state of the sentient activity which is different from simultaneous states by its relative intensity. Life is Action. Mutual life is Consciousness in the wider sense. The actions of the organism are many, various, but interconnected: some are unapparent, others are apparent; some are the components of combined results not separately recognised; others are groups which seem independent of each other. All the actions which go to form the group

Respiration are vital actions, though we only consider their result. Respiration is, or seems to be, an action independent of Digestion; and Locomotion, a group independent of both. It is thus also with mental actions. They have a relative independence, and an absolute interdependence.

PERSONALITY.

166. We are thus led to another aspect of the question, which must have continually obtruded itself on the reader's thought during the foregoing discussion, but which it was necessary to leave unnoticed till we had established certain positions. By Consciousness, the intervention of the Personality is usually understood. In this sense the conscious state is "the recognition by the Ego of its own operation." It is *we* who feel.—What is that Personality?

167. Hitherto we have been considering particular states consequent on stimulation of particular organs, with only a tacit reference to the general sentient state of the organism. Changes in the sense-organs, and changes in the Sensorium, have been treated as isolated events; so that while describing each change as a thrill, and the varying degrees of relative intensity and diffusion of such thrills as conscious, subconscious, and unconscious states, we have kept in the background the consideration that each of these was a variation of the general state, and that they all combined to form a total, which total in turn determined the character of each succeeding state. We must now bring this consideration into the foreground. We must consider that organs are only differentiations

of the organism, parts which have no vital significance except in relation to a whole, their actions, however seemingly independent, having an *overruling unity and consensus.*

168. Accompanying the particular feelings excited by present stimulations there is not only the operation of past feelings, awakened residua, which blend with the present and determine the perceptions, there is also the general stream of simultaneous excitations, with their residua, constituting the vague massive feeling known as the *feeling of existence,* the *sense of personality,* the unity which connects parts into a total. The diffusive waves of Systemic Sensation, the more definitely restricted waves of Sense, the delicate and continuous changes of Thought, are combinations of excited and subsiding tremors, and their recombinations,—all which blend into a total. It is this total which is our Personality, every single state being vivid or obscure according to its relation to this general state. Personality corresponds psychologically with what physiologically is the guiding influence of the centre of gravity. Every part of the body has its weight; the whole has its centre of gravity, and the movements are regulated by that. "Our walking," says Goethe, "is a series of falls;" but the series is co-ordinated by the feeling of central equilibrium. The position of the centre of gravity is a continually shifting point. The attitude of the Personality is likewise a continually shifting point.

169. Consciousness depends on a twofold process of differentiation and integration, whereby the Subject is differenced from the Object (also the total from a part), and at the same time identified with it. The

sense of Difference is accompanied by a sense of Community—indeed is only thus possible. When ideally we separate a whole into parts, we have always the whole present in thought. We can remember the elements of which a group is formed though we may only " fix " the formed group. If we distinguish the various parts of our body, it is always in tacit implication of the whole; and when we distinguish ourselves from the external world, there is always a tacit reference to our identification with it. To discriminate a particular feeling is only possible when there is a background of feeling from which it is detached. This, translated into physiological terms, is saying that a particular state of sentience is only possible in the activity of an organ which is part of a sentient organism. And, since we have shown that the discrimination is the reflex of Attention, we may conclude that every particular feeling is the *momentary attitude of the organism,* the shifting of its centre of gravity. The physiological law that no neural excitation is normally isolated from the excitation of the whole nervous system, and that its discharge is conditioned by the state of that system at the moment, has its psychological equivalent in the law that no sentient state is to be isolated from the psychostatical condition of the Sensorium. Each thrill of change blends with, or is arrested by, the mass of simultaneous thrills; so that there is a continuous co-operation of the two processes of differentiation and integration, and of particular feelings with the general feeling or Personality.

169a. An image may assist us here. Each of the Senses has its special domain. The domain of Vision is sharply demarcated from that of Hearing. There is a visual field, with the sharply-defined objects appearing in it, and so differenced from it. There is an auditory range, with its sharply-defined tones. And so of the other senses. Each has its range; but each is only a domain in the general expanse of Feeling. Just as in the visual field there is a general illumination, and a variety of illuminated points, the eye fixing now this and now the other point, but always embracing the whole illuminated field; so within the sensorial horizon there is a general excitation of Sensibility with a variety of particular groups and particular elements of groups, the Attention now being fixed on this, and now moving to another, but always solicited by the whole of the excitations. It is this general sensorial field which we understand by our Personality, our Self, and to which all particular fields, and all particular objects in those fields, are referred. Whether this reference takes place by a rapid oscillation of Attention from one to the other, or by a simultaneous clutch of the two processes of change, it is not easy to decide. But familiar experiences show how possible it is to have, in what is practically one and the same perception, a combination of the general feeling with the particular feeling. Thus in reading, the eye takes in at once the single letters of a word, the total of those letters, and the bright surface of the page on which the word is written. We find, on experiment, that as each letter is distinctly seen all the others are obscured; however rapidly the eye passes from letter to letter, it does habitually fix each, and as it fixes one it leaves the others vague; very often the eye retraverses the course, respells the word; and all this while there has been a sensation of the white page and the black letters detached from that general background; for only thus could the letters have been read. As the eye passes from word to word there is a successive obscuration of each antecedent word, and this rapidly passes from subconscious obscuration to unconscious; but the impulse is carried on, and the Sensorium is still agitated by the results of the sensible affections; so that we can, and often do, recall the words into clearness.

170. Another illustration. We enter upon some scheme or plan of action; and this is very vague except as to the end in view. That vague feeling, however, suffices to direct and correct each step towards the end. Every movement is tentative, and is tested by its relation to the foreseen end. Those which seem favourable are repeated, others rejected. The particular is seen in the light of the general, just as every single sensation is seen in the light of our Personality. After long practice the movements become so organised in reference to the end in view, that the scheme of itself suffices to co-ordinate the movements without our giving more than a fugitive subconscious glance at them. To intend to write a phrase, or draw a figure, is enough, provided the intention be not arrested by some stronger impulse. The phrase which cost us so many efforts to write, when each letter demanded its separate and exclusive effort, may now be written when we are thinking of something else. It is by similar organisation of multitudinous experiences that we are enabled to regulate Conduct by abstract moral conceptions, and

to regulate Research by abstract scientific conceptions. Feelings of what is worthy, just, honourable, gentlemanlike, are the silent standards of our moral life. They are often so obscure that they are said to be instinctive. They are present and operant, even in minds incapable of bringing them into the daylight of consciousness. They then fall under the Logic of Feeling, and are classed as intuitions, tact, character, &c. They form the moral core of our Personality; as generalised conceptions form the intellectual core, and generalised sensations form the sensible core. Every sensible impression, every proposition, every social action, is *apperceived* by this personal centre. Our individuality, or idiosyncrasy, is its expression. Of four men gazing on a sunset, all will have similar visual impressions, but each will react on these according to his personal disposition — one will interpret them according to the abiding religious attitude of his mind; a second, according to the æsthetic attitude; a third will interpret the signs as favourable to the condition of his crops, or to-morrow's expedition; a fourth will be as indifferent as a cow to the splendours of the sky: the light of the setting sun enables him to find his way across the fields, but he is only subconscious even of this.

171. Not only is the influence of our organised experiences in the personal individuality thus a determinant of particular feelings, and the more we *are* the more we *see*, but the influence also operates by a sort of negative beneficence. I allude to the case in which, according to a suggestive remark of Professor Bain's, many ideas are disturbing.

"Promptitude of action," he says, "is greatly favoured by the fewness of the considerations that enter into a question. Marvels of ingenuity are often accomplished through absence of superfluous suggestions. In the operations of animals happy efforts occur to surprise us as being apparently out of keeping with the range of their faculties; in some instances the explanation is found in the limitation of their views. The animal does not suffer from a crowd of incompatible suggestions." The same explanation may be given of the fact, familiar to all students, that theorising is often greatly hampered—as well as aided—by a knowledge of details. The meditative mind is apt to be irresolute in thought as in action. "We cannot see the forest for the trees." Lest this should be interpreted as favouring the notion that ignorance is the fittest condition for the exercise of genius, we must remark that minds unfurnished with the needful knowledge of details can only by accident stumble on a truth. The ignorant mind is not without its "spiritual chances;" but it has not the same range of chance as the instructed mind, and has not the same test of truth or error. Still it remains true, that the impartial vividness with which some comprehensive minds take in a wide range of details may check even the legitimate daring which enters into the theoretic as into every other method of explanation.

172. It would be premature here to enter upon the question of Self-consciousness, and its correlative distinction of Self and Not-self. I will merely say that what is indicated by the term Personality in the Logic of Feeling, is common to animals, infants,

and men; what is indicated by the term Consciousness of Self, is a *conception* only reached through the Logic of Signs. Comte humorously says that the cat, although never saying "I," never takes itself for another. The personal consciousness which the cat has is in the man raised into an abstract expression, which then becomes an object of meditation. A higher psychical significance attends this raising of Feeling into Symbols; and the man's consciousness of Self is, of course, not the *same* as the cat's consciousness of its existence.

The Self is therefore the consensus. Its intervention is very variable. It may be likened to the expansion and restriction of the visual field, which at one moment takes in a vast landscape at a single glance, at another is restricted to some particular object in that landscape. Daily experience familiarises us with the fact that the Sensorium may take in a wide range of feelings, or be restricted to a narrow range and even to a single feeling. We may be intently occupied with a problem or with some external event, and when thus absorbed in thought or lost in wonder, there is in consciousness only the obscurest reference to Self. The Ego does not here recognise its own operations as its own. The Consensus is operant; the Personality determines the train of thought and the emotional reaction; but the visual field is restricted to particular points. Yet it may expand, and by rapid side-glances we may become more or less conscious of the speculative effort or the emotional effect.

173. The alternate expansion and restriction of the sensorial field is normal. In abnormal cases, as in

the unconsciousness of dreamless sleep, of course the restriction is such that although there is *sensus* there is no *consensus*. The mechanism is out of gear, and the Personality which represents its consensus is in abeyance, to reappear with the re-establishment of the mechanism. In other abnormal cases the mechanism is so irregular in its action that an excessive expansion of the sensorial field, instead of including both a particular feeling and its relation to the Personality, includes such widely different particular feelings that the illusion arises of a Double Personality. This will be treated of in the next chapter.

CHAPTER XI.

DOUBLE CONSCIOUSNESS.

174. THE preceding exposition will have prepared the reader to accept the view of many psychologists who hold that Consciousness is *seriated* Feeling; not change only, but seriated change. Each state is the termination of some prior state, and the origination of a successor; not in *discontinuous* succession, but in *serial integration.* There is a certain discreteness, of course, the states being separately discriminated, and as often heterogeneous as the groups in the line of a caravan; but the line of march admits of only a single file, the point of connection of two heterogeneous groups is that each enters the file, but of the multitudinous sensible affections only those come into the series of Consciousness which are connected each with its predecessor and successor by the reflex attitude of Attention. If a visceral sensation suddenly obtrudes itself in the march of meditation, it is because its agitating energy has excited the reflex withdrawal of attention from impersonal abstractions to personal feelings; but the visceral sensations, momently obtrusive, may again drop out of the series, and the march of thought go on; or visceral sensations may never even rise to subconsciousness owing to the preoccupation of thought.

The rise in Consciousness, which means the entrance into the series of discriminated feelings, is always a question of excitation. Where the Sensorium is already agitated, very violent stimulations may fail to find a place. Furious maniacs lacerate and burn themselves, soldiers in the ardour of the fight have limbs shattered, yet no sensation from these sources is felt.

175. If Consciousness is a series, the question arises, Can there be two simultaneous states of Consciousness? Can we feel two sensations, or think two thoughts, at one and the same instant? Connected with this is the very interesting question of Double Consciousness, namely, Whether the Mind can and does carry on two disconnected series, each of which has its separate personal implications? In other words, Can we accept the hypothesis of a Duality of Mind corresponding to that of a Duality of Brain?

There is no postulate more widely accepted by psychologists than that of the unity of the Soul, which the physiologists represent by the unity of its organ the brain. For many this means that the Soul is a simple entity which animates and directs the organism, and manifests itself in various feelings and acts. For others it usually means that the brain is a single organ having special properties and functions, which as the supreme centre directs the lower organs, impressing its unity on their diversity, or co-ordinating their various activities into its unity. There is a point of view in which this conception is acceptable; but the more consistent conception seems to me to be that of assigning the unity of mental phenomena, like that of all vital phenomena, to the organism as a whole.

176. From the first there has been recognised the necessity of distributing this unity among several more or less independent groups, in order to classify the phenomena intelligibly. The ancients never hesitated in separating the Rational Soul from the Sensitive Soul, and both from the Appetitive. Their successors admitted a distinct Vital Principle, side by side with a Psychical Principle. Following the system of classification by *symptoms,* they separated Intellect frôm Sense, and Volition from both; so that, in spite of the postulated unity, there insensibly arose a personification of independent Principles and independent Faculties. The physiologists followed this lead, and sought for the separate organs of such faculties.

177. If we replace this classification of symptoms by a classification of *organic conditions,* we reconcile the unity with diversity. The organism is one, acting variously through differentiated organs; its unity is the consensus. The observed unity of sentient phenomena depends on the solidarity of the nervous system; their diversity on the variety of the connections of this system and its modes of excitation. The domain of visual sensation is sharply demarcated from the domain of auditory sensation, but they have both their central unity in the Sensorium. This, which has rarely been overlooked by psychologists, has often been disregarded by physiologists in their search for localisations. There was a time when the Intellectual Faculties were distributed variously, and when they

came to be localised in the brain; there still remained Sensation which was localised in the Five Senses, and the Passions which were localised in the Viscera. Gall, consolidating the floating speculations of his day, boldly withdrew all mental phenomena from the organism at large, to localise them severally in the cerebral convolutions—with the single exception of the sexual instinct, which he assigned to the cerebellum. It was a bold artifice, and had the scientific advantage of giving definiteness to research. But it was defective in its unqualified dissociation of mental from vital activities, and of one organ, in a complex, from all the others; it was also misleading in its restoration of the notion of a multiplicity of independent organs and faculties each capable of isolated activity. Gall's hypothesis has fallen into discredit; but still physiologists assign different centres to Sensation, Perception, Thought, and Volition, not to mention the Reflex centres which they exclude from the sphere of Sentience.

178. And this seems justified by Introspection, which, classifying by symptoms, naturally concludes that Sensation, Perception, Thought, and Volition are independent. Introspection goes further, and proclaims the existence of a Double Consciousness, in explanation of familiar facts. Thus when a man feels irresistibly compelled to do or say something which at the very moment his soul abhors and resists—when he is solicited by a temptation and struggles against it—when he is so far master of certain impulses that he can foresee their fatal consequences, and is at the same time so little master of them that he foresees his inability to control them, and begs a

bystander to prevent his carrying them out, begging even to be placed in confinement lest he become a criminal, it may well appear to him that two different principles are at work, two different personalities struggling within him. Faust passionately exclaims :—

> Zwei Seelen wohnen, ach, in meiner Brust,
> Die eine will sich von der andern trennen ;
> Die eine hält in derber Liebeslust
> Sich an die Welt mit klammernden Organen ;
> Die andre hebt gewaltsam sich vom Dust
> Zu den Gefilden hoher Ahnen.

179. The facts call for explanation. The question to be settled is, Are these antagonistic feelings due to the reactions of two separate centres ? or to two different stimulations of one and the same centre, the attention oscillating rapidly from one to the other ? Those writers who consider Consciousness a property of cerebral tissue, are justified in assigning to each cerebral hemisphere its separate and independent Consciousness : for them the facts point to the existence of two centres. Those, on the contrary, who consider Consciousness an attitude of the Sensorium, will assign the facts not to the independent and simultaneous action of two organs, but to successive alternations in the attitude of the one Sensorium. Psychological and physiological analysis seems to prove that the criminal impulses are feelings which have their conditions in sensory stimulations and logical combinations, involving judgments and motor-combinations of precisely the same nature as those impulses which restrain them. The impulse to destroy an object, or to murder some one, arises from some obscure desire, some hallucination, or some

clearly apprehended idea of gratification; this impulse represents the state of the Sensorium at that instant; but no sooner does it emerge in Consciousness than it brings with it an escort of other feelings; and their impulse, which also represents a sensorial state, is one which restrains the former. All ideas are incipient actions. The idea of stammering, the desire not to stammer, will cause a man to stammer; the idea of yawning, or the sight of one yawning, will cause a yawn. In some states any strong desire *not* to do a thing will call up so vivid an image of the act that the incipient stage passes into the completed stage. Maury relates that a friend of his was apt to say the very things she wished not to say; the fear of uttering some improper word would cause her to explode in obscenities. One day while walking along the corridor of a chateau, candle in hand, she was seized with terror at the thought of being alone in the darkness—and blew out the light (MAURY: *Du Sommeil*, p. 418). Such conscious conflicts are easily explicable, without recourse to Double Consciousness of a Double Brain; the rapid succession of alternating states suffices. Thus, say that the stimulation of hunger prompts a man to seize a loaf; that is the first impulse; but before it passes from the incipient to the completed stage, a vision of consequences, including the agitating images of punishment or disgrace, restrains him. The first impulse may nevertheless prevail; he then says, "I could not help it." Nor could *he* help it, having no organised experiences of sufficient strength. Had he refrained from snatching the loaf, he would have successively been conscious of the solicitation and of the control.

Had he yielded to the solicitation without hesitation, where would his Double Consciousness have been?

180. Jessen knew a gentleman who was, so to speak, conscious of his own insanity. During convalescence from a fever he was incessantly occupied with wild projects, and uttered absurd speeches, conscious all the while of the absurdity of his plans and his words, but unable to check them. This twofold mental activity he personified as his Rector and Conrector. The Rector (sane consciousness) clearly saw the irrationality of the Conrector, but could not quiet him; so that the gentleman begged his listeners not to heed his irresistible chatter, but go away and be no longer plagued by it.*

If we interpret such a case as evidence of a Double Consciousness, and not as evidence of a rapid alternation, there will be equal grounds for the hypothesis of a multiple Consciousness, since several widely different processes may be taking place in what is practically the same time. Thus, we are walking with a friend, and while listening and replying appropriately to his remarks, we hear the birds sing and the railway train in the distance, we see the sky and the fields, we feel the rough stones over which we walk, and the tight boot that is pinching us importunately;—yet all this while some recurring problem of interest, or some haunting thought, keeps its course in our Consciousness. Here are many simultaneous strands of feeling. The question is, whether these are coexistent in Consciousness as rapid alternations, or as coexistent attitudes.

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* JESSEN: *Versuch einer wissenschaftlichen Begründung der Psychologie*, 1855, p. 189.

181. It may be objected, perhaps, that the incongruity between the Rector and Conrector is not analogous to the difference of state in replying to a friend and thinking of a problem; because in the latter case there is alternation but no struggle, and the feeling of struggle is that which points to a double action of a double organ. There is however a struggle even in the latter case, faint indeed and not emotional, but operant. We must suppress thinking of the problem to attend to what our friend says; having listened and replied, we again attend to the internal process set going by the starting of the problem. All those successive sensorial states which are congruent, linked together by association or by community of external conditions, pass easily without exciting attention to their transitions: thus the alternations from the sight of the fields to the scent of the newmown hay, or from the blue of the sky to the forms of the clouds, are linked together by their concurrence; whereas the alternation from these to our friend's remarks, or from his remarks to our problem, is abrupt, and forces itself on our Consciousness. Still more abrupt and incongruent are the impulses of temptation and resistance; it is because these are related to a single act that they excite a feeling of conflict which was not excited by the alternations having different acts in view. Hence one state seems to watch and control the other.

182. In Jessen's case we have alternations presented which are broadly contrasted, and very rapid. The alternations of rational and irrational combinations of ideas is here only unlike ordinary experiences in its *continuance.* We all know what it is to feel

sad while aware there is no rational ground for sadness; and what it is persistently to hope for some result which reason tells us there is no prospect of our attaining. Our Rector and Conrector are at work here. Again, who does not know what it is to be continually dropping asleep for a few seconds, and then dreaming, yet awakened by the fall of the head on the chest, that fall scattering the dream? Those who have watched delirious patients have observed that at times the delirium suddenly ceases, a rational answer is given to some question, or an object is recognised; the next instant the incoherent babble is resumed. Jessen had a patient who, under the hallucination of persecution, would pour forth a torrent of abuse against his imaginary persecutors. "If I stood by the door on entering the room he would sometimes fail to notice me, and when he did see me would spring at me as an enemy. Whereas if instead of waiting at the door I walked up to him and spoke, he saluted me in a friendly manner and talked quite calmly as long as I chose to remain" (p. 465). Another patient had lucid intervals of from 10 to 15 minutes, in which he rejoiced in his deliverance as if awakened from a nightmare; but he relapsed into raving as before.

183. These examples suggest one-half of the explanation, namely, that the "lucid intervals" of Jessen's friend (with the Rector and Conrector) were more rapid and more fugitive than ordinary. The other half may be sought in the familiar fact of the persistent recurrence of certain states. A name, a phrase, a fragment of melody, a remembered insult will persistently obtrude itself, no matter how irrele-

vant it may be to the train of thought or the external conditions. If we suppose Jessen's friend before his fever to have been intensely meditating on certain projects which his reason rejected, it is intelligible that these projects should recur with even more dreamlike irrationality in his excitable condition, and yet be rejected as before.

184. But although this psychological explanation may be accepted on the supposition that Consciousness is the shifting-point of Attention, and that there can only be one personal centre and one momentary attitude, it does not by any means dispose of the physiological explanation that in such cases the two hemispheres were in dislocated activity. It is possible that both explanations may be correct. Let us first see on what grounds we may infer an independent action of each hemisphere.

185. We have two eyes, two ears, two hands, two hemispheres. These double organs act together, and also separately; the destruction of one eye is not the destruction of the other, nor is lesion of one hemisphere followed by the symptoms which follow a corresponding lesion in the other. Both in structure and vascular irrigation the two slightly differ. Ever since Bichat formulated his imaginary law of the symmetry of animal organs (his own brain being found to be remarkably asymmetrical!), the fact that the two hemispheres are visibly different has become popular. Indeed there are inequalities more or less striking in all the double organs. The kidneys, ovaries, hands, eyes, lungs are alike, yet different; the left lung has but two lobes, the right three. Functional differences must correspond. In the

hemispheres, as in the hands, we may assume a certain difference of power, and an independence of action, together with a community and convergence. There are actions we have learned to perform with the right hand which we cannot perform with the left, or can only so perform with great difficulty. It is quite possible — and modern researches have made it highly probable—that with respect to Language the left hemisphere predominates: whatever part cerebration may have in the linguistic mechanism, it is normally and principally effected by the left hemisphere.

186. Seeing, then, that the hemispheres are so far capable of independent action, that certain phenomena are mainly due to the intervention of one or the other, and that the destruction of one is not the complete destruction of psychical activity, nor of conscious states, we may reasonably conclude that although habitually acting together, converging as the eyes converge for more efficient action, they have the sort of isolated activity which is manifest in the eyes and hands. When both eyes are open various objects are indirectly seen by each eye, and any one of these may be directly "fixed." Shut one eye, and you at once exclude from the visual field a certain number of objects; to see these you must turn your head. This movement is only an exaggeration of the delicate and unconscious oscillation which habitually traverses the visual field. Both movements are the reflexes of Attention; and this means the obscuration or exclusion of all other objects in favour of one. The case is similar with the ears. A friend of mine, who is deaf in one ear, tells me that sharp sudden

sounds, even when not loud, completely blot out the tones of a speaker's voice. He can only hear distinctly one kind of sound at a time—though he can hear a speaker when an indistinct buzz is going on. That is, he has only one ear, and with that he cannot rapidly oscillate from one kind of sound to another. As in the visual field the closure of one eye excludes all objects within its range, so in the auditory field the closure of one ear excludes all sounds within its range:—the auditory impressions reach his Sensorium only through one ear, and he has to turn his head in the direction which will effect this; it is not enough to turn his Attention, because that is already occupied despotically by the impressions which reach him through the other ear. The case is analogous with the hands: a two-handed man can grasp objects with each, and rapidly turn his attention from one to the other, the stimulation being continuous from both; the one-handed man must let drop the object in his seizure of another object. Let us suppose a man to hold a soft velvety object in one hand, while in the other he holds a rough gritty object; he will be alternately conscious of each, he will compare the sensations appreciate their delicate differences, reflect upon these and upon himself as feeling them. Each hemisphere is here involved with the sensori-motor apparatus of each hand; they are both therefore in action, both have sentient processes normally grouped.

187. If therefore by Consciousness we understand Sentience, or if by Consciousness we understand Cerebration, then since here there is obviously

Cerebration, and presumably Sentience, we must admit a Double Consciousness, the activity of a Double Brain. But on such grounds we should have to admit a Double Volition, and a Double Personality. Nor could we pause here, but must go on to admit a Multiple Volition, a Multiple Personality, and thus replace the unity of the Organism by the multiplicity of its organs.

188. The view of Consciousness preferred in these pages is not hampered by such difficulties. We have seen that the discriminated experiences comprised under Attention must be regarded as a *series;* but the true comparison for sensorial reaction is that of a *web.* The attitude of the Sensorium is a fluctuating attitude which successively traverses and retraverses all the positions of the sensorial field, and which thus successively brings now one and now the other point into the daylight, leaving the others momentarily obscured though still impressing the sentient organism; we can understand, then, how among the numerous impressions many are so rapidly brought under focus that they seem simultaneous; and how two or more strands of quite different impressions shall be alternately fixed by the "yellow spot" of Consciousness, and yet, owing to their disparity, seem like two personalities. When we watch our internal changes it may well seem that the watcher and the watched are two; and it is quite *possible*—though not, I think, more than possible—to explain this by assigning the office of watcher to one hemisphere, and that of the watched to the other. Insane patients not unfrequently imagine themselves double; the absurdities or violences they commit they attribute to "the

other;" they even give this other a name. In one such case related by Jaffé (*Archiv für Psychiatrie*, 1870) one hemisphere was much atrophied, and "the man being differently constituted on each side felt himself as two different persons." If the personality is the attitude of the organism, and if this is rapidly alternating, then when two attitudes are expressions of complex feelings widely opposed in character, the notion of two minds will naturally arise. There are several deeply interesting cases on record of persons who pass from a normal to an abnormal condition, remaining some hours, days, weeks, and even months in each, and thus living as it were two different lives with no mental bond between them, the experiences of the one state being mainly obliterated in the other. We who watch these changed aspects know that the organism is only manifesting itself differently owing to some change in the internal relations. We who watch the insane patient know very well that his "self" and his "other self" are not two different persons. And we who watch our own operations know very well that there is no difference between watcher and watched. But we also know that the organism has different organs, and if we choose to regard one organ as the seat of the watched process, and another organ as the seat of the watcher, the notion can hardly be disproved, though it would disturb both Physiology and Psychology.

189. Closely connected with this subject is the question whether the Mind is capable of attending to, or being conscious of, more than one state at a time. Hamilton maintains that we are capable of attending to six simultaneous impressions; and Cardaillac

(*Études élémentaires,* 1830, ii. 125, *et seqq.*), with great beauty of style, has illustrated the complex of conscious and unconscious states which at any moment are co-operating. The question demands a preliminary settlement of what is meant by Consciousness, and what is meant by "the same time." That six or more impressions may simultaneously affect the organism, no one doubts; if they affect it they are sentient states, but whether they are conscious states is a question of definition; and whether they can all be attended to at the same time or not, will depend upon whether "time" be a mathematical or a psychological category. We certainly can attend to and discriminate more than one impression in the interval between two pendulum beats. There is, however, a limit; for each impression occupies a certain fraction of a second in exciting the reflex. The serial nature of Consciousness implies that two thoughts, or two sensations, must have an interval separating them. The physiological mechanism implies that, although various sense-organs are simultaneously impressed, the sensorial reactions which determine the reflex of Attention must be successive. For each group is formed out of neural elements that were before occupied in some other; it is a rearrangement; and although we may suppose a number of coexistent groups, yet only that one which has the greatest relative energy finds its discharge in a reflex.

190. Moreover the tremors subside gradually, they sink into subconscious and unconscious states, in which they readily re-form themselves into new groups so that the serial succession is really unbroken.

When Ducrow rode six horses at once he pressed the reins of each alternately, now checking, now redirecting. Attention in like manner shifts from one series to another. In the act of walking there is a repetition of the original impulse, which is sustained by the repetition of stimulation; but the mechanism once set going needs but an evanescent fugitive attention, unless some change in the stimulation occurs—as when the road is rough or we are weary. It is the same with the vocal efforts in speaking and the still fainter efforts of silent speech. While we are listening to our friend's remarks the problem which occupied us drops out of attention, to reappear the next moment, if there be sufficient *interest* excited to keep up a sustained stimulation.*

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* DR. ANJEL had a patient who, during the most absorbing conversation, could not repress the insistent recurrence of some trivial counting process, such as that of counting the panes of glass of the window, the pictures on the wall, or the patterns of a carpet. The two mental trains ran on together, and although he had learned so far to abstract his attention from the counting process as not to let it interfere with his following the conversation, he was sometimes mastered by it, and, unless he moved to another position, could not attend to the speaker. (*Archiv für Psychiatrie*, 1878, viii. 2, p. 407.)

PROBLEM III.

THE SPHERE OF SENSE AND LOGIC OF FEELING.

> "Bien que mes spéculations me plussent fort, j'ai cru que les autres en avaient aussi qui leur plaisaient peut-être davantage."
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> DESCARTES : *Discours de la Méthode.*

THE SPHERE OF SENSE AND LOGIC OF FEELING.

CHAPTER I.

THE LOGIC OF FEELING AND THE LOGIC OF SIGNS.

1. ACCEPTING the explanation of Thought and Feeling as modalities of Sensibility, we shall have no difficulty in extending this generalisation to the laws of operation and convincing ourselves that both the co-ordination of sensations and movements, and the logical combination of ideas with movements and of ideas with ideas, are effected by one and the same kind of process. The application of the term Logic to any processes save those in the intellectual sphere, and of the term Judgment to perceptions, may indeed at first sight appear paradoxical and fanciful; yet when this application is once familiarised it will be found to have immense advantages.

2. The term "Logic" is variously applied. It sometimes designates a particular branch of study: the exposition of the rules of Proof, the codification of the laws which convert inferences into certainties. At other times it designates a psychological process: either that of Judgment or that of Reasoning.

I here employ the term to signify a process; and not simply the process of Reasoning, but that which is common to Reasoning and to all other modes of combination belonging to mental states. This common process is Co-ordination, or Grouping of neural elements. Adopting the etymology which derives the word Logic from *legein*, to "bind together," every one recognises its applicability in the phrase "the logic of events," the combination and succession of events by which the antecedent determines the consequent and is included in it. Thus also does one mental state determine its successor, and is included in it, the *inclusion* being also the *conclusion*, the product a combination. One judgment being combined with another, the product is a judgment named a conclusion. One mental state (sensation) combined with another (inference), the product is a judgment named a perception. The elements differ in the two cases:—in the one case the combination is of verbal symbols, in the other it is of sensations and images; but the combining process is the same. Symbols are mental states essentially the same as images, and images are mental states essentially the same as sensations. It may, I think, be shown that what is specially known as Thought in the combination of conceptions, stands in the same relation to Feeling in the combination of perceptions as Algebra to Arithmetic, having indeed some laws and conditions peculiar to itself, but resting on the same fundamental laws and conditions; just as Human Intellect has laws and conditions not found in Animal Intelligence, although the same fundamental laws and conditions are common to both.

3. It is clear that the sentient organism in virtue of its constitution can never be wholly passive, it cannot receive an impression without reacting; so that every succeeding impression is combined with the effects of its predecessors, and the groups thus formed constitute first sensations, then perceptions. A perception is always a judgment; the effect ot a present stimulation is combined with and ranged under the residua of past stimulations. The sight of an object recalls its unseen qualities. We see the qualities of colour and form, and infer the qualities of solidity, taste, scent, &c., though these once-felt qualities are now unfelt. This is the process of Inference. We infer that when the coloured object is brought within the range of other senses than the eye, it will yield certain feelings. Inference is virtual sensation. It is this, even in the most abstract judgments. If I hear that a Frenchman has solved a mathematical problem, or committed a murder, I apprehend the meaning of these words only in so far as the words are to me symbols of experiences which once were perceptions. If I conclude that the soul is immortal, I do so by inferences which are intuitions of what have been sensations, and what again would be such were I placed in the needful relations. Although I have never tasted a particular fruit, yet because this fruit resembles those I have tasted, it recalls their taste, and I infer that this fruit also will taste as they did; my inference may be wrong, and can only be verified by reduction to sensation; but its probability is so great that I rely on it in practice. And even supposing that I have never tasted any fruit at all resembling this one, yet if those whose

authority I respect solemnly assure me that the fruit has the flavour, especially if from childhood upwards this assurance has been given me by many whom I respect, I infer the flavour when I see the fruit. It is thus also the immortality of the soul is inferred. No one has had any experience of immortality, but many experiences suggest the inference, and it is sustained by the complex authority which we call tradition.

4. In the Language of the Schools a judgment is said to have three terms—subject, predicate, and copula. In the proposition "Sugar is sweet," sugar is the subject. The quality which sugar is said to have (that of affecting taste as sweetness), is the predicate. The union of sweetness and sugar is the copula. Dealing, as logicians do, with abstractions, they are consistent in taking each of the three abstractions—sugar, sweetness, is—as three terms or elements of the judgment; but, as I have shown on a former occasion,* psychologically this is inexact, the real process having only two terms not three, the copula not being a third element, but the integration of the two; † just as a *conclusion* is not really a third proposition added to the major and minor propositions but the *inclusion* of the one in the other, the synthetic expression of these analytical terms. Be this as it may, each term is—or was originally—a judgment; and the process of grouping by which two judgments are integrated in one conclusion, is the same process as that by which present and past

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* *Problems of Life and Mind*, II., pp. 141 seq.

† The copula *is*, in "Sugar is sweet," is only a sign of operation like the *plus* or *minus* of Algebra—an operation necessary to there being a judgment, but not a term co-ordinate with subject and predicate.

sensations are integrated in one perception, and present and past impressions are integrated in one sensation. Isolated stimulations would yield no sensations; they must be combined; and their combination must be such that a sense of Difference and Resemblance will arise: and herein lies the germ of Discrimination, which is the conspicuously logical phenomenon.

5. The logical *process* is abstracted as a form: it is not the judgment, but the judging; it is the co-ordinating act, not the product. To this artificial distinction we add another, namely, between the *affective* and the *active* aspects of the sentient mechanism, the affective comprising the modifications of sensibility in the reception of stimuli; the active comprising the reactions. Not that sensory and motor changes in the Sensorium are really separable, but to separate them in abstraction is convenient; and such a distinction agrees with the popular view of Sensation being the passive, Thought the active, state of the mind. Instead of Thought let us say Grouping-process or Logic, and the unity of all mental states becomes explicable. We have thus Sensation, Perception, Appetite and Emotion, which determine Volition, Instinct, and Intelligent conduct; their laws being embraced in the Logic of Feeling. Next comes the intermediate stage of the Logic of Images, closely connected with that of Feeling on the one hand and that of Signs on the other; and finally, compounded of these two, rising higher as the grouping of groups, is the Logic of Signs, embracing Conception, Sentiment, Ratiocination, with their products Intellect, Conscience, and Will.

6. There are judgments of two classes, the Intuitive and the Critical. The first is one of simple inference linking together two mental states—either an actual impression with a revived impression, or a symbol with a symbol. The grouping has become so organised that the relation of the two states is intuited; *i.e.*, we see the relation, we do not see the grounds of inference. When the cultivated mind judges that sugar is sweet, or that $2 + 2 = 4$, it has not at the same time present to consciousness the grounds on which such judgments are warranted; the chemist is equally oblivious when he judges sugar to be a carbohydrate. To justify these judgments, and to render explicit their implicit terms, is the office of Criticism. It is needless to say that the Animal Logic — the Logic of Feeling — is never critical, always intuitive. To know that a certain feeling of colour or of scent will be followed by other feelings of touch and taste, pleasure or pain, is enough to guide the animal in approaching or avoiding the coloured and scented objects. The Logic of Feeling has here its premisses in the sensations and its conclusion in that registration or representation of former experience, by which the immediate sensation rouses its former sequel and thus stimulates an act of pursuit or avoidance. To raise this process into the Logic of Signs it is only necessary that symbols should replace the sensations; and then, by virtue of the generalising nature of symbols, the continually repeated experience of corresponding sequences issues first in the general proposition that such and such antecedents will always carry such and such consequences, and finally in the higher generalisation

that similar antecedents will always have similar consequents.

7. Note the gradations. A reptile discerns its food by sight or smell, and as a consequence knows how to direct its actions in the seizing and devouring of such food. But actual sensations of sight or smell are indispensable, and very false conclusions as to the nature of the objects discerned may follow from such sensations.* A hen, or a dog, will discern that food is near at hand by indirect indications unlike those of the sight or smell of the food—the presence of the person accustomed to feed it, the rattle of plates, the sight of a basket, &c. The hen or dog will remember the place where food is kept; the dog will remember even the place where it has been hidden by himself or his master. The Memory is here far more complex than in the case of the reptile. The Logic of Images is operative; and this is seen in the invention of *stratagems* to secure the hidden food; actions which are conspicuously intelligent. A child will add to these indirect means the interpretation of verbal symbols: he will know where the food is placed by hearing the place *named;* and his stratagems will also be suggested by other verbal symbols. When the child has reached a certain development he will know that the food now hidden will be produced at a given hour; or may be procured by going to a shop, and there offering money. To be told that he shall have the food, and to know that he can buy it, are to him premisses as cogent as sensations and images are to the animals; but they are premisses in the Logic of Signs.

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* Compare *Physical Basis of Mind*, Pr. iv., § 73.

8. Observe the parallelism: from sensations we pass to inferences, *i.e.*, from actual sensations to virtual sensations, and the truth or error of the inference is verified by the conversion of the virtual into the actual, the reduction of a revived image or represented feeling to a present sensation. The three stages in the progression of Experience are sensation, inference, and sensation again. This also is the progression of Science: a datum, an hypothesis, and a verification: a starting-point of expectation, a search, and a finding. And not only can we trace the similarity of procedure in the simplest and in the most complex logical products, we can only understand the simplest by a light reflected from the most complex. Comte says: "The simplest judgment as to an external fact may be put into the form of a scientific problem in which the mind endeavours to produce a conception that shall harmonise with the total sum of impressions received from without. The less distinct these impressions are, the greater is the effort of the mind to substitute its own combinations which are often very subtle and far-fetched. When there is a strong desire for a decision and yet no external facts sufficient to justify it, it is sometimes founded on purely internal reasons, due simply to a strong reaction of the Affections upon the Intellect." * This exposition of the procedure which in Science is called Hypothesis, is obviously applicable to the state of mind of the animal, or the infant, or even of the cultivated man, when *hesitation*, which in the intellectual sphere is *doubt*, disturbs the course of judgment. So long as the succession of feelings

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* COMTE: *Politique Positive*, I. 713 (*English trans.*, I. 576).

correspondent with the order of events is a reproduction of past experiences in the same order, there is no place for hesitation:—the sight of an object is so associated with its taste, or other quality, that the two feelings become one, and the action they determine is due to their simple motor-intuition. But if after such an association has been established some fresh experience rudely shakes it;—if instead of the pleasant taste inferred from the familiar sight, a bitter taste is felt; then the shock given to the mind will be such that on the next presentation of a similar object, two opposing tendencies will be aroused, one of attraction, the other of repulsion. The hesitation which ensues will finally be settled by a choice determined by the strongest desire. So completely does a strong desire overpower the evidence, that even rational men, *à fortiori* animals and children, will disregard and suppress their past experiences, and conclude that the result will turn out in conformity with their wishes; as they will suppress all contradictory evidence, and believe a certain proposition to be true because they strongly desire it to be true.

9. Aristotle, whose occasional insight into the deepest truths makes his treatise *De Animâ* still worthy of study, has especially noted in the Sentient Soul a logical faculty[*] common to that in the Noetic Soul, though applied to different purposes. Indeed no one observant of animals can doubt that many of their actions imply the same logical processes as similar actions in men. It cannot be denied that they also infer, judge, reason. If they are denied Thought, this can only be because of a special mean

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[*] . . . . τῷ κριτικῷ ὃ διανοίας ἔργον ἐστὶ καὶ αἰσθήσεως, III. 9.

ing assigned to the term. They think in sensations and images as we do; but they cannot, as we can, think in verbal symbols. When a cat smells odours, or hears the sounds which raise up the image of a mouse—or, if this be doubted, let us say which excite the particular feeling consequent in the perception of a mouse—she creeps stealthily towards the spot, waits there for hours in expectation, and pounces on the mouse directly it appears. In what does this differ from a man's imagination, expectation, and pursuit of his prey? To say that the cat acts by Instinct, and the man by Reason, is to cheat ourselves with phrases; both act according to the same physiological and psychological laws; and although these laws have a wider range of application, dealing with more various elements of Experience in man than in animals, man's 'large discourse of reason' enabling him to vary and extend his modes of attack, this wider range designated Reason does not obliterate the essential identity of the processes. In both cases it is the Logic of Feeling which is operative. And this may be supplemented by the Logic of Signs when the man, instead of simply following the direct impulses of his immediate sensations and images, pauses to reconsider the situation, and invokes *generalised* experiences condensed in verbal symbols, so that he mentally says to himself, or vocally to his companion, "That sound was made by such or such an animal, we must move silently, and when it appears spring on it." The cat says nothing of this, yet combines her feelings and actions with a like logicality.

10. There is a fish which can throw a drop of water

with such precision that it generally succeeds in hitting an insect hovering over its head. By a similar combination a boy will throw a stone and thus bring down a bird; he needs, indeed, more practice to attain this precision, though I doubt whether a very young fish would not also fail until practice had established the connection between certain visual impressions and certain muscular actions; but even if we suppose the connection established in the fish at birth, this only suggests a difference in historic development. The fish, however, is restricted to this one method. The boy has many methods; he may bring down the bird with a boomerang, bow, cross-bow, gun, &c. Yet whatever method he employs, it is the Logic of Feeling which is operative; and that is similar in him and in the fish. Mr. Spencer contrasts this power of aiming in the fish with that of the "archer who points his arrow, not at the object he seeks to hit, but above it, and who varies the angle of elevation according as the object is far or near," thereby exhibiting "something more than a special response to special stimuli, for his procedure implies consciousness of the fact that bodies projected through the air descend towards the earth, and that the amount of their descent has some relation to the distance traversed. Besides a correspondence with certain perceived relations in the environment, there is implied a correspondence with the law of certain other relations not present to the senses." * No doubt there is an implication of this curious fact, but we can hardly say that this "consciousness" of it is in the archer—unless we include consciousness

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* SPENCER: *Psychology*, I. 352.

in the response of his organs to the special stimulation, and in *that* case the implication is equally present in the fish. Of course it is possible that instead of remaining implicit, the law of unseen relations may be explicitly present, and the archer using the Logic of Signs may mentally say : "I must vary the angle of elevation, because," &c. This is conspicuously the case in artillery practice ; and yet an experienced gunner will point his piece with great precision without any mathematical knowledge over and above what is *implied* in his experience. The statement of a Ventriloquist that he was trying constantly for many hours daily till at last he suddenly succeeded, and having once found the right combination of muscles could always reproduce it, led Dr. Wigan to a happy idea, since worked out with great success by Prof. Bain, namely, that the process of intellectual invention, whether of things actually new, or only new arrangements of the old, pursues a similar course of trial, so that by constantly meditating on a topic, by trying as the Ventriloquist tried, we make innumerable combinations till accidentally we hit on exactly that which is desired. Prof. Bain has shown how when it brings pleasure or relief a movement is sustained which was accidentally hit upon. The same is true in all logical combinations. In the Logic of Feeling those premisses which lead to successful conclusions are registered ; the rest are excluded. Whether the premisses are actual sensations, virtual sensations (inferences), or verbal symbols of sensation and inference (ideas), the process is the same. Any strong feeling connecting one visual impression with some gratified desire is a logical process. "We may be perfectly certain," says Mill, "that the things capable of satisfying hunger form a perfectly distinct class in the minds of the more intelligent animals, quite as much so as if they were able to use or understand the word food." It is the connection of darkness with terror which in the mind of a child makes a black dog or black cat terrible.

11. Although the Logic of Signs may render explicit relations which in the Logic of Feeling are implicit, and may often be an indispensable aid in actions which have not yet become firmly organised, it is a questionable aid, and sometimes a positive obstacle when once the organisation has taken place. High skill in any form of practice leaves reflection, calculation, reasoning, to the expository mind of the philosophic spectator, and cannot stay to justify its method. And with less perfect accomplishments it is often observable that when we have once learned to combine our visual impressions with muscular contractions, then any interference of the calculating or reasoning process is generally a source of failure. And with what certainty and rapidity the changes are combined in Fencing! Every slight indication of the adversary's arm or eye is at once responded to by a movement of defence. How do we *know* that he is *about* to thrust, or to feint? Just as the dog knows that you are about to strike him when he sees you take up your stick in one way, or about to go out for a walk when he sees you take up your stick in another way. If it be said that the dog does not *know* these things, only *feels* them; then must it equally be said that the fencer feels, does not know,

his adversary's intentions. The only difference is that the fencer can, and the dog cannot, express this feeling in words, which words have *general* significance.

12. The nature of Judgment as an organic process does not vary with the nature of the premisses it combines. The hen cannot count her chickens before they are hatched, nor afterwards; but she can perceive whether all her brood is present or not; and her intuition that two are missing is a judgment identical with that of a human mother missing two children. Nay, strictly speaking, even the savage cannot *count*, but he can judge that two sheep and three sheep form a group equal to another group of five. When I say he cannot count, I mean that he cannot substitute abstract symbols for concrete perceptions; he perceives the five sheep to be similar to the group of two and three sheep, when the sheep are before him, but in their absence he cannot intuite the equation of $2+3=5$. Mr. Galton has a striking example of this in his account of the Dammaras: "They seldom lose oxen; the way in which they discover the loss of one is not by the number of the herd being diminished but by the absence of a face they know. (This is the case of the hen also.) When bartering is going on, each sheep must be paid for separately. Thus suppose two sticks of tobacco to be the rate of exchange for one sheep, it would sorely puzzle a Dammara to take two sheep and give him four sticks. I have done so and seen the man put two sticks apart, and take a sight over them at the sheep he was about to sell. Having satisfied himself that the one was honestly paid for, and find-

ing to his surprise that exactly two sticks remained in hand to settle the account for the other sheep, he would be afflicted with doubts; the transaction seemed to come out too 'pat' to be correct, and he would refer back to the first couple of sticks; and then his mind got hazy and confused and wandered from one sheep to the other, and he broke off the transaction, till two sticks were put into his hand and one sheep driven away, and then the other two sticks given him and the second sheep driven away." *

13. Many of our actions, like those of the animals, are erroneously interpreted as due to the Logic of Signs (*i.e.*, the distinct consciousness of the significance for knowledge of certain appearances) when they are really due to the Logic of Feeling. When for instance a child sees you on all fours pretending to be a dog about to spring on him, he does not believe you to be a dog, nor does he pause to reason out the matter which would convince him that your appearance was not that of a dog; he is simply terrified by the suggestion, and this emotion determines his actions. So when vague emotions of awe are excited by ghost-stories or suggestions of robbers present, the excited hearers are ready to interpret trivial signs in the direction of their fears; but it is the fear which precedes the images, the fear which determines the acts. Gratiolet mentions that his dog was thrown into fits of terror by the faint scent of an old piece of wolf's skin. This, however, does not imply that the dog had any instinctive vision of the wolf—only that the scent disagreeably agitated him.

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* GALTON: *Tropical South Africa*, p. 132, quoted by LUBBOCK: *On the Origin of Civilisation.*

The other day my horse, who had never been observed to shy before, shied at a patch of water in the middle of the road. I was surprised at this; but on driving some dozen yards or so farther, we overtook two men leading a bear. This explained the shying—or seemed to do so; but on reconsideration I found that the horse did not shy at the sight of the bear, which he passed quietly, so that it was the odour of the bear's urine which had startled the horse, as any other sudden disagreeable sensation would have startled him, not the "instinctive terror at a bear" inherited from ancestors. The Logic of Signs would have interpreted the odour as a sign of the presence of the bear, and the idea of the bear would have roused the emotion of terror allied with it.

14. By Logic of Feeling then we understand those mental processes in which the elements of the judgment or the determinants of the act are sensations, perceptions, images, appetites, instincts, or emotions. By Logic of Signs we understand similar processes in which the elements and determinants are such feelings combined with symbols—mostly verbal symbols—or in some cases are combinations of symbols only. The former comprises the sensitive life common to animals and man; the latter is the intellectual life, and is exclusively human.

NOTE.

The terms Logic of Feeling, Logic of Images, and Logic of Signs, are borrowed from AUGUSTE COMTE; and I am deeply indebted to him for them, though they represent totally different meanings in his pages and mine. Some years ago, my studies of Language as a mental faculty led to the conception that Thought stood in relation to Feeling as Algebra stands to Arithmetic. Previous studies of the nervous system had led to the conception of the uniformity of its processes; the structure being essentially the same in Brain, Medulla Oblongata, and Spinal Cord, and identity of property being the necessary consequence of this identity of structure. While these two revolutionary conceptions were struggling to reduce the complexity of mental phenomena to orderly simplicity, I came upon Comte's threefold division of Logic, and saw in it the completion of my efforts, the principle of classification which expressed the unity and diversity of the phenomena. It was itself one more example of the power of symbols in generalising and extending observations; all the more so because the meaning I attached to the symbols was conspicuously not the meaning attached by Comte. *What* he precisely meant I could not discover, because the only interpretation which his statements seemed to admit, appeared too irrational to be accepted as the meaning of so profound a thinker; but at all events it was clear that he did not understand the terms as I understood them.

The publication of the English translation of the *Politique Positive,* with its serviceable index, has enabled me to collate the passages in which he explains his meaning. The *Logique des sentiments* must be rendered "Logic of the Emotions" rather than of "Feeling" in the comprehensive sense which I attach to the term; and he characterises it as the "logic of working men and women," also of savages, since he regards Fetichism as its mode of handling abstract and general questions, a handling impossible without the Intellect, so that the Logic of Feeling designates "the reaction of the Heart on the Intellect." The Logic of Images is "the colligation of ideas in accordance with their connection with sentiments," and finds its expression in Polytheism. It is the logic of Poets, "strengthening personal recollections by fixing them in images, and thus making them more vivid. Images are the links between feeling and signs. It is easier to associate a notion with an image than with a feeling." Finally, the Logic of Signs is the "art of combining ideas by appropriate signs." It finds its expression in Monotheism.

Being unable to understand this, I do not criticise it. My purpose here is, while acknowledging a great debt in the assistance the terms have been to me, simply to point out that in my pages the terms have not the significance assigned to them by Comte.

CHAPTER II.

THE TRIPLE PROCESS.

15. The significance of mental phenomena is their relation to Conduct. All that we feel and know of the world, of our fellowmen, and of ourselves, is how we are or how we may be sensibly affected under given circumstances, and by such sensible affection be impelled to act. Mind is the sum of affections and actions. The forms of Feeling called Experience, Knowledge, Theory, are *directions how to act.* They are organised in this way: we feel hunger, for example, and this passive state of excitation, when not connected with a definitely established activity, discharges itself in incoherent struggles, cries, and other muscular agitations, which bringing no relief only increase the central disturbance. At length one of these movements brings us in sensible contact with food: a relief is obtained, the hunger is stilled, a rudiment of experience has been gained. Repeated many times such, rudiments leave a residual disposition in the nerve centres, so that the whole group of feelings may be subsequently reinstated by any one of them, and thus the sight or smell of the food, or even of the accompaniments of the preparation, suffice to guide action. We see one detail, and by it perceive the food; we seize on it

because this particular movement is organised in connection with this particular perception.

It is in this sense that an animal can be said to *know* his food when a sensation has its escort of experience, and this has its corresponding action. The action may be *instinctive*—the operation of a connate disposition of structure; *intuitive*—the operation of an acquired disposition of structure; or *intelligent*—the higher development of such acquired disposition, which by its wide reproduction of experiences permits the 'cerebral rehearsal' of an act, a prevision of both its end and its means.

16. The sentient mechanism is represented by the nervous and muscular systems, with their respective properties, Sensibility and Contractility. The two are dynamically one, and I generally speak of them as the neuromuscular system in order to keep this unity of action present to the reader's mind. In the organism Motion is inseparably connected with Sensation, and *vice versâ*. They are as the two poles of a magnet. The separation of Contractility from Sensibility and of the muscular from the nervous system is an artifice necessary both for physiological and anatomical exposition, but in the synthetic view of functions, movements are the incorporation of sensations, the direct consequences of stimulation. Anatomy tells us why.

The system is constituted by units thus composed: first, there is a sensory, or ingoing, nerve, connected with the external world at one end, and with central substance at the other; secondly, there is a motor, or outgoing, nerve, connected at one end with central substance and at the other with the external world through its termination in muscle; thirdly, there is this central substance which not only connects the two nerves, but also connects all the different pairs of nerves into one system: it blends Stimulation with Discharge, and one neural process with all the others.

17. The current view on this point needs rectifying. It professes that sensory nerves are receptive of stimuli, and thus originate sensations, but that motor nerves are non-receptive, and have only to conduct discharges on muscles. It further professes that the central substance is composed of two halves having diametrically opposite properties, although in all aspects similar in structure: one-half receptive of sensory impression, the other only capable of motor excitation.

If in describing the working of a steam-engine we separate the expansion of the steam from the motion of the piston, and say the expansion causes a pressure on the piston and the pressure causes the movement, we do not mean that the expansion is one thing, the pressure another, and the movement a third: these are simply three modes of viewing one mechanical process, with the emphasis laid on one or the other condition. Still less do we imagine that one-half of the steam is receptive of the molecular agitation named *heat*, the other half being non-receptive of this, but capable of the molecular agitation named *pressure*. The heat has two names, Expansion and Pressure: as the first, it indicates the change effected in the water; as the second, the change effected in the dynamical condition of the piston. The steam will continue to expand in the absence of a piston, and its expansion will be a pressure somewhere, but it is no longer a mechanical factor in piston movement. And just as the expansion *is* the pressure, the pressure *is* the movement. Apply this to the physiological process: the molecular agitation of the nerve-centre has two names, Excitation and Discharge, representing the phenomena of Sensibility and Contractility in the completed physiological process. It is this excitation which moves the muscles as it is Expansion which moves the piston. In both cases there are complex conditions, and we may select now one and now the other condition for emphasis; always remembering that the separation lies in our artificial procedure and not in the concrete fact.

18. To continue our exposition: The sentient structure is constituted by an aggregation of the units described in §16. But it is not simply an aggregation, it is an integration of such units. In Biology, *parts* are analytical fictions; they have their significance only as related to the whole. The integration of the sentient units and sentient organs is effected through the community and continuity of the central substance, which thus, while leaving to each factor its individual activity and value as a force, converges the separate forces into a system.

The working of this system may be viewed under three aspects, corresponding with the triple form of the constituent units. These three stages or processes of the system at large, and of the several forces, are Excitation, Grouping, and Discharge.

19. Under the first are to be ranged the manifold gradations of Pleasure and Pain which help to differentiate mental states, and which are important regulators of action. These two qualities accompany

most of our conscious states. Every one knows what they are as qualities; no one has yet had a glimpse of any conditions to which they are reducible. We accept them as modes of Sensibility. It is, however, a mistake to regard them as invariable qualities, inherent in sentient activities; since much of even our conscious activity is pure excitement of the system without the faintest colouring of pleasurable or painful feeling, while the whole of our unconscious activity is, of course, excitement only. The clear apprehension of this fact—that pleasure and pain are not necessary concomitants of sentience—is important to the right understanding of the relations of Physiology to Psychology, and the otherwise baffling conception of unconscious processes.

20. Excitation of the mechanism, then, is Sensibility with its several modes, of which some are pleasurable, some painful, and some neutral. All its modes are followed by Discharge—a motor-impulse, causing either a contractile tremor or a full contraction. So that from the motor-side Excitation appears under the form of a reflex movement, an automatic movement, or a voluntary movement: each according to the central grouping which innervates it. For example: the *actual* contact of a stimulus is followed by a sensation which is discharged in a reflex movement; the sight of an *impending* contact is followed by a motor intuition which is discharged in an automatic movement—as when we duck to avoid a falling stone; and finally, the prevision of a *possible* contact is discharged in a voluntary movement.

21. Intermediate between these two processes of Excitation and Discharge there is the process of

combination and co-ordination, the Grouping which is the central reaction. That the popular notion of a sensory nerve directly transmitting its excitation to a motor nerve is founded on imaginary anatomy I have already shown in the *Physical Basis of Mind.* According to the complex and fluctuating conditions of each momentary disposition of the centre the sensory impression excites its escort of nascent-states: the wave of impulse is diffused throughout the system, but meeting at various points with varying resistance, it sometimes causes a general disturbance, at other times a very partial disturbance, and thus issuing in a conscious, a subconscious, or an unconscious sensation, emotion, or thought, is reflected on the muscles accordingly, and is followed by a complicated movement, a simple movement, or only a *tendency* to move. How the Grouping manifests itself in Intelligence and Co-ordination will be expounded hereafter. We have here only to consider it as the intermediate element of that Triple Process which underlies all sentient phenomena.

22. According to the laws of Sensibility as already formulated (Problem ii. ch. 3), each sentient state depends on the nature and energy of the stimulation, and the condition (or *level*) of the reacting Sensorium. Each excitation is necessarily accompanied by subordinate excitations, revivals of the residua of former stimulations; and each wave of excitation is necessarily restricted more or less to certain paths of least resistance. It is this restriction or grouping process which determines the individuality of the sentient change, and also the unity of the muscular changes. A sensation is this or that, a movement is this or

that, not so much because a particular stimulus has affected the organism as because the organism was then and there capable of only reacting in this particular way: the issue of the excitation has been the resultant of a composition of forces. A sensation of light, for instance, is physically referred to the impact of ether waves on the retina; but these waves are not luminous; the retinal affection is not luminous; the luminous effect is the reaction of the Sensorium, which depends on immensely complex and fluctuating conditions. Experiment proves that a sensory impression, normally effected, is only a conscious state when discriminated from simultaneous impressions, and is only felt in relation to them. Feeling has its diapason, in which the value of every note is determined by its position in the scale. One colour is not seen by itself, it is seen by its relation to others. Contrast, change, is a primary condition.

23. We have thus decomposed the working of the sentient mechanism into its three fundamental constituents. If our analysis has been correct we shall recognise these factors in every psychical product; if it has been exhaustive we shall find no others to be in operation. In the simplest and in the highest phenomenon we shall everywhere discern the Triple Process of Sensible affection, Logical grouping, and Motor impulse; and it is the varying degrees of predominance of one or the other of these which determines the individuality of the psychical phenomenon. That is to say, while in all phenomena the three fundamental modes of Sensibility are in operation, so that in figurative popular language all may be said to involve sense-work, brain-work, and muscle-

work, in each particular case the energy of one of the factors is dominant.

To illustrate this novel conception I proposed to name the Triple Process *The Psychological Spectrum.* It was not perhaps a very felicitous name, but the optical spectrum furnished the readiest image I could think of. That spectrum is said to be constituted by three fundamental colours—red, green, and violet—each due to a particular order of vibrations, or the reaction on such vibrations. Not only so, but each colour is found to contain among its conditions the orders of vibration which characterise the other two; that is to say, one colour owes its special character not to an order of vibrations absent from the others, but to the predominance of one order. Thus, while there is a quantitative value specially assigned to red, there is in every red ray a certain amount of the vibrations characteristic of green and violet; in green there are over and above the special vibrations assigned to green, both red and violet vibrations; in violet both green and red. What the physicist professes to demonstrate with regard to the optical spectrum, I profess to render acceptable with regard to the psychological spectrum. We shall presently see how every neural process is constituted by neural units—tremors which may be likened to the etherial pulses, and how it is from the predominance of one order of tremors that mental states are quantitatively and qualitatively individualised. According to the analogy I have indicated, the motor-impulse is bound up with the co-ordinating and sensory activities, as the red waves are bound up with the green and violet. The sentient structure is such that "it moveth altogether if it move at all," every excitation being necessarily neuromuscular and central; just as the retina responds according to its structure, whether its threefold response be due to three different kinds of fibre (according to Young and Helmholtz), or to three different modes of excitation. We cannot banish the red waves from a luminous sensation, we can only lessen their energy or predominance; and, as I maintain, we cannot extricate a conception from a motor element, a movement from a sensory element, a sensation from a grouping and a motor element, we can only recognise the predominance of one or the other.

24. In reflex actions, automatic actions, gestures, and voluntary actions, there is a successive prominence of the sensory element and occultation of the motor element. In cerebral rehearsal the motor element although present is in complete occultation, so much so that its presence has long been unsuspected and will be disputed; as the idea passes into act, and the motive becomes a volition, the motor element is more and more conspicuous, conversely in the automatic and reflex actions the sensory element is so obscured that its presence has not been recognised.

The intermediate process (brain work) may be either Desire or Thought—logical combination of emotive or cognitive elements. The final process—discharge—may be a movement of limb, an expression of face, or a word: the word may be silent.* The proportion of the motor element is that which differentiates Desire from Will; Thought as mere succession of images and ideas from Thought as Intention. To it also belongs the quality of certainty, which means readiness to act on belief: to it belong the emotive effects of an idea. An idea that is seen to be unrealisable in act has a very different power from one that is realisable. To 'dally with the faint surmise' is not to *think* an act; and there is a conspicuous difference between reverie and attention, between seeing and looking.

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* "Des actions réflexes qui sont plus spéciales au cerveau. . . . produisent du côté du mouvement des actions réflexes qui ne se traduisent pas immédiatement par des contractions musculaires, mais qui se bornent à fournir les excitations et les images motrices les plus générales

Although the course of physiological inquiry has of late years tended manifestly in paths which severally converge towards this conclusion, and I shall presently have to notice the approaches made towards it, there is so conspicuous a paradox in my statement that I am prepared at this point to have very sceptical readers whose hesitancy can hardly be overcome without much illustration, much tracing of the Triple Process in various regions.

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pour des mouvements futurs de la complexité la plus grande et pour des actions musculaires composées (actes).—GRIESINGER: *Traité des Maladies Mentales*, p. 20.

effluvia reach the lining membrane of the nose without producing odours. In all such cases we may have other grounds for believing that the stimuli are active, and that the sensory nerves are affected, but either because the stimulation is too faint, or because the sensorial reaction is prevented by some more powerful stimulation, no appreciable sensations result. These affections, then, must be regarded as elementary components. In order that out of such components there should issue a resultant which is appreciable, namely a sensation, the Sensorium must undergo a change of state: this change is a liberation of its tension, a disturbance of the psycho-statical condition.

26. We now take another step. Science has discovered in many cases that the disturbances which are sensations are due to certain quantitative conditions of frequency and amplitude in the vibrations. Each colour, each tone, has its definite quantity, neither more nor less. Thus it is that waves of ether may beat upon the retina in ripples that are too small or in billows that are too large to disturb the molecular balance. "The energy transmitted to the eye by the flame of a candle half a mile distant is more than sufficient to inform consciousness; while waves of a different period, possessing twenty thousand million times this energy, have been suffered to impinge on my retina with an absolute unconsciousness of any effect whatever" (Tyndall).

27. Another condition is that of rhythm. A succession of very gentle taps if periodic will move a heavy body such as would remain unmoved by irregular blows of a hundredfold greater violence.

The balance which is undisturbed by irregular impulses, or impulses too wide apart for summation, yields to the summation of regular impulses; and irregular impulses tend to nullify each other instead of being convergent.* One of the cardinal characteristics of the neuromuscular system is that its balance is continually disturbed by the rhythmical impulses of gentle rapid shocks to which it responds in tremors. A gradation is noticeable in the Senses with respect to their susceptibility to impulses, the retina being the most susceptible of all.

If in a pair of scales two quantities are so nearly balanced that even the addition of nine grains on the one side will not sink the scale, the addition of a tenth grain may cause the scale to dip. One grain effects what nine grains failed to effect; but only by completing the sum of pressures requisite to disturb the balance. Let us apply this mechanical principle. Muscles have the property, Contractility. Under definite stimulation of rhythmical shocks this property manifests itself in contraction. The contractile tremor of a muscle-fibre which follows one shock is not a contraction, moves no limb, it is only one of the components of a contraction: a rapid succession and a fusion of such tremors into a group, is necessary for a muscular contraction. We must bear in mind that *contractile tremors which do not become contractions are incessantly produced.*

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* "The energy liberated has to overcome a certain resistance before it can act as a stimulus, and it is necessary for the tension of the energy liberated to reach a certain amount previous to stimulation, just as gas constantly passed through a bent tube under water does not rise in the tube in a continuous stream, but in an intermittent manner in bubbles of a certain size, since it is necessary to accumulate a certain pressure in the tube in order to overcome the resistance due to the cohesion and weight of the water. In this manner a *rhythmical* stimulation is accomplished. . . . Any force which could increase or diminish this resistance would influence the frequency of the rhythm and the strength of each stimulus, just as an increase in the cohesiveness of the water would render the bubbles less frequent but greater." HERMANN: *Human Physiology.* Trans. by GAMGEE, 1875, p. 471.

28. What is here said of Contractility is true of Sensibility. The single vibration of a sonorous body is not a sound, it is only one of the component units. A single tremor along the neural track is not a sensation, it is only one of the sentient units: when such units are fused and grouped in certain definite ways they yield correspondingly definite sensations, conscious or unconscious.[*] A smith hammering the cold iron feels its vibrations in his hands and arms, hears the vibrations as sounds, and, as the effects of the blows are summed, he soon sees the iron begin to glow with light, and feels its radiated heat. These various sensations are the responses of

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[*] Students of Mr. HERBERT SPENCER will doubtless have been struck with the fundamental resemblance between this view of Sensation as constituted by neural units, and that put forward in the second edition of his *Principles of Psychology*, § 60. When the part appeared (Oct. 1868) which contained that section, Mr. SPENCER asked me whether I agreed with his view, and my answer was to take down an old note-book, the latest entry in which was dated July 1866, wherein I had written two passages expressing precisely the view expounded in my text; the only difference being that in these notes I call *neuries* what in my text I call *neural units*.

This concordance of two independent inquirers is not remarkable when both were not only working on the same Method, but both were specially directed by the same predecessor. It was the discoveries of HELMHOLTZ which furnished us with our principal suggestion. M. TAINE in his remarkable work *De l'Intelligence* has adopted a similar view, but one cannot say whether he also deduced it from HELMHOLTZ, or accepted it from Mr. SPENCER. The Italian psychologist, ARDIGO, who though very liberal in citation gives no indication of having read either Mr. SPENCER or M. TAINE, has nevertheless propounded substantially the same theory: *La Psicologia come scienza positiva.* Milan, 1870.

his sense-organs to the various vibrations. If we imagine a machine so constructed as to be able to impress on a rod of metal vibrations of every degree of rapidity, we can set forth an imaginary gradation in the sensory responses. Thus, in a darkened room the rod begins slowly oscillating, and we feel its impacts on our skin as so many gentle taps; when the vibrations of the air thus excited become sufficiently numerous we feel them as *pulses*, which we hear as *puffs*. When these puffs reach a rapidity of 16 in the second they pass into the deepest bass tone. Here begins the specific response of tone; and it will run through the whole musical gamut as the vibrations increase in quantity, the tones becoming shriller and shriller (but *not* louder) until the vibrations amount to 36,000 in a second. Then all again is silence. The vibrations may increase and increase, but this increase brings with it no sound. It may be that here, or somewhere about this limit, the molecules of the air suddenly cease to move; they have reached their limit of oscillation; and any fresh impulse will move the air in a mass, but not move it in waves.

Besides the air, however, there is ether, and this takes up the motion of the rod. At first the etherial pulses are not powerful enough to move the comparatively heavy molecules of a sensory nerve: for such an effect a greater rapidity is requisite, and when this reaches 18 millions in a second the sensory nerves of the skin respond in what is known as a sensation of warmth. The leap from 36,000 vibrations of air to 18,000,000 vibrations of ether is the leap from Sound to Heat. Can we wonder that the two responses are so markedly different?

The rod continues its acceleration, and when it reaches 462,015,500,000,000 in a second, then only is it luminous. The sensation of Heat disappears, giving place to that of Light—that is, to red rays. The rays pass from red to yellow when the vibrations reach 540,834,840,000, to green when they reach 582,031,200,000,000; and to violet when they reach 733,990,100,000,000, in a second. Such at least are the verdicts of the Calculus. Then all is darkness. The oscillating limits of sensory reaction have been reached. But there are other and more delicate reactions which assure us that chemical decompositions are effected by vibrations exceeding 8 billions in the second. *

29. What has just been stated concerns almost exclusively the objective side of the problem. Viewed in the light of physical science, the reduction of sensation to sentient tremors, and these to neural units, is irresistible. But we have only the physical question thus within our grasp. Because it is the easiest way of approaching the subject, and admits of the quantitative precision of experimental research, it has been largely adopted by modern investigators. The objective method, however, here halts. We must not suppose, as it is too commonly supposed, that the molecular changes in the nervous system have any likeness to the processes observable in the objective stimuli. I mean, if we assume that the vibrations of air and ether which are the stimuli of sounds

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* On this subject compare DOVE: *Ueber Wirkungen aus der Ferne*; GEORGE: *Die Fünf Sinne;* and WUNDT: *Menschen-und Thierseele*, I. 179.

and colours, are succeeded by and prolonged in vibrations of the neural tissue—an hypothesis which needs far better evidence than has yet been offered—we must still remember that such neural vibrations will be conditioned by the nature of the neural tissue, and *this* is too conspicuously different from air or ether for its vibrations to be of the same order as theirs. I have already explained why a gap here occurs in our efforts to trace the course of the physiological process. All that we are able to establish is a correspondence and equivalence between certain orders of external vibration and certain kinds of sensible affection. The intermediate process, the change in the organ, may be one of wave-movement, or of chemical decomposition, or of electrical polarity. Whatever it is, we can prove that it is determined by the external stimulus, and, within certain limits, is equivalent to the quantity of that stimulus. If therefore the stimulus is decomposable into units of vibration, the stimulation it effects will be decomposable into units of Sensibility. Thus the qualitative variations in Sensation are dependent on quantitative variations in the neural activity, and these again are determined by variations in the external agent.

30. Each musical tone has its primary or fundamental tone, together with partial upper tones or harmonics — these latter being due to co-existent vibrations of other orders. The sum or resultant of these primary and secondary vibrations is the particular note and its peculiar *timbre* or quality. The same note, sounded by violin, violoncello, bassoon, or flute, has in each case a markedly different quality, but as each instrument sends forth the same primary

tone, the differences must result from the harmonies with which in each case it is associated.

31. What has been proved in regard to colour and tone may fairly be generalised, and inferred in regard to all sensations. We may therefore assume that the neural units, which are sentient tremors, form the complex web of Sentience; and that the infinite gradations of Feeling are determined by two factors: the *quantity* of units blended into each group, and the *configuration* of the group, dependent on the way the units are blended.*

This is of course an abstract formula. We may be confident that each colour depends on a definite quantity of neural units, but this quantity is only indirectly dependent on the external stimulus, and directly on the state of the optic tract and the Sensorium. Exhaustion of the optic tract will modify the effect of the stimulus; † an excited state of the Sensorium will often prevent a fusion of the tremors into a group.

32. An analytical basis is established by this view of the quantitative relations among sensations, which must be extended to all feelings whatever. At

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* Neural units are the letters of the sensible; groups are the syllables, words, and sentences; grouping is the grammar, speech the movement, sounds are the motor-feelings.

† HIMLY found that when the retina is over-excitable every stimulus is raised to a higher degree in the scale of colour—black becomes violet, and violet red; the reverse is observed when the retina is torpid. M. DELBŒUF relates that one of his colleagues "ayant soumis accidentellement l'un de ses yeux à l'action d'une lampe d'argent, fut très surpris en jetant ses regards sur un papier buvard de le voir jaunâtre avec cet œil et rouge avec l'autre. De même un papier blanc lui paraissait jaune ou bleuâtre, suivant qu'il fermait l'un ou l'autre œil." *Rapport sur les questions relatives au Daltonisme.* Reprinted from the *Bulletins de l'Académie de Belgique*, xlv. No. 4.

present I must confess that it is only a speculative ingenuity, or at the best a mode of conceiving mental phenomena with more ease. But I am persuaded that one day the Calculus will come to be applied even to psychological questions, and if so it is this view of neural units which will furnish the differentials.

THE GROUPING OF UNITS.

33. The sentient tremors are the units of the psychical substance, but they have to be associated in groups, fused into separate figures to form sensations, images, and ideas.

In Arithmetic we recognise two elements, 1, Number, and 2, Operations on Number. Each number *was* an operation, that is, a grouping of numerical units; but *now* it is a group, and is operated on as if it were an unit; the operation consisting in adding to, or separating from it, other units. In this sense we may understand the elements of Feeling: the sensible units are grouped into sensations; and the logical operation of grouping is repeated and varied by an infinite diversity of addition and subtraction. Everything in Arithmetic that is not number is operation. Everything in Experience that is not sensible affection is operation. The sensible affection belongs to what is called the passive side: *Æsthesic;* the operation belongs to the active side: *Kinetic.*

34. The process of grouping determines all the varieties of Modes. To it belongs in the first place the Quality of each feeling, as distinguished from its Quantity. One feeling differs from another of the

same genus, as one *timbre* differs from another of the same note by its associated harmonics. One emotion differs from another, and one conception from another, not only by the quantitative differences in the neural units severally combined in each, and in their forms of combination, but also by the associated harmonics of nascent states which accompany each group. A stretched string vibrates when struck; but it vibrates differently at every point, and its total vibration is compounded of many superposed vibrations. Each appreciable order of vibration belongs to a segment of the string, separated by a *nodal point* from the next segment. The timbre is due to the intermingling of the superposed vibrations. If some obstacle prevents the formation of a nodal point, all the upper tones which require that nodal point vanish.

This illustration is only meant as an image. We are not to suppose that nerve fibres are stretched strings, or that their excitation is the same as that of vibrating strings; but knowing the central nervous system to be always affected throughout, when affected at all, we may liken neural tremors to the superposed vibrations. We thus conceive every specific feeling representing a particular timbre. With its fundamental note—that which determines the genus—the sensible affection has varying harmonics, which are the nascent revivals of former sensible affections. My perception of a rose agrees, say, with your perception in its fundamental note, and in its octave, third, and fifth—because our organisms are similar, and our experiences are similar. But your organism is somewhat different from mine, and your experiences have been more varied than mine; your perception is therefore of a wider comprehension, your nascent states accompanying the sensible impression of the rose are somewhat different from mine; and although we both employ the same term, and both designate by it the same object, yet in point of fact the rose to you is perhaps as unlike the rose to me as the *c* sharp of a violin is to the *c* sharp of a piano. The absolute agreement exists only in the General Mind—assigning the same place in the scale or system of things to the object which has a different place in each individual mind.

35. Once more I warn the reader not to suppose that these physical illustrations are advanced as proofs. They are simply means of facilitating our analogical construction of psychological processes. We do not know what is the real nature of these processes; but we are forced to imagine them under the forms of processes that are familiar. The main fact on which our exposition rests is indisputable, namely that sensations, perceptions, emotions, conceptions, are not simple undecomposable states, but variously compounded. Every sensation is a group of sensible components, together with the logical operations of addition and subtraction. It is the product of a Triple Process, the elements of which are Sense, Logic, and Motor-impulse.

CHAPTER IV.

SENSATION AND PERCEPTION.

36. THE current classifications were established long before much insight was gained into the factors of the facts. The sun rose and set before mathematicians were ready with a theory of such appearances; it rises and sets still, for ordinary speech, though we know the terms are inexact. In the same way we may continue to speak of Thought as if it were something wholly different from Feeling, and of Volition as something wholly different from both. We may see reason to believe that all three are modes of Sensibility: to justify the difference of name it is enough for us that they are different modes. Carbonic oxide and carbonic acid are different things, though in both there are only carbon and oxygen.

37. Feeling is a term of wide range. Even in its more restricted range it embraces two different modes, since it early becomes differentiated into Sensation and Perception; and each of these has two phases: conscious and unconscious.

Sensation, like most other terms in our Science, is used with laxity even by the most careful writers, so that a definition is certain to mislead. Instead of a definition we will attempt a description. The most widely accepted meaning indicates a conscious state of Feeling. Thus considered, Sensation is a purely mental fact, which is only referred to a bodily fact by way of explanation of its origin. This reference is rendered necessary because there are other conscious states of Feeling which are not called sensations. The obvious fact of the bodily contact of the sensitive surface with some external object is fastened on as a distinctive mark, so that Sensation is designated the conscious state of Feeling consequent on some external impression; and as there are particular portions of the organism which when thus acted on yield sensations of particular characters, these are called organs of sense; and thus the brief definition of Sensation is "the reaction of a sense-organ."

This, which seems so clear, is quickly troubled again when we find that the term is also applied to other feelings not thus referable to organs of sense. There are sensations of Hunger, Thirst, Giddiness, Respiration, Effort, Fatigue, Pain, &c., all due indeed to bodily states and stimulations of nerves, but not definitely assignable to objective stimuli. The nearest approach to a definition of these is to call them the reactions of nerve centres due to stimulation of sensory nerves not by external but by internal stimuli: a definition which applies equally well to Emotion and Ideation.

38. Failing thus to find a consistent definition on the bodily side we recur to the mental side, and say Sensation is a conscious state, known as such by distinctive characters. No one confounds a sensation of colour or of sound with the image or the idea of that colour or that sound, no one confounds the sensation of hunger with the emotion of terror, the

sensation of effort with the remembrance of the effort. Even when the image of an object seen reproduces accurately all the details of form and colour, there is in the feeling named Sensation a well-marked energy which is at a lower level in the image. And between a sensation and an emotion there is a well-marked difference in the localised restriction of the one and the diffused irradiation of the other; for even in the diffused sensations of hunger, giddiness, &c., there is a localisation of the feeling to certain regions and organs. Thus the two distinctive marks of Sensation are energy and localisation of feeling.

39. The chief source of the difficulties besetting this topic is the mistake of assigning Sensation to the organs of sense instead of to the Sensorium, *i.e.*, to the organism reacting on the stimulation of the sense-organs. A sense-organ is a specialised part of the structure with its special nerves, nerve-terminals, ganglion and (hypothetical) termination in the brain. An impression on the nerve-terminal is propagated through the whole of this neural tract, and is a sensation only when the process is completed by the reaction of the Sensorium. It is not in the retina, nor in the optic nerve, nor in the corpora quadrigemina, nor in the optic thalamus, nor in the termination of the optic fibres in the cerebral cortex (if there *is* such a termination), nor in their co-operation, that sensation is effected, but in the reaction of the Sensorium stimulated through this neural tract: in other words a sensation is an excitation of the sentient organism, which reaction has its specific determination from the organ stimulated. This excitation may be

either a conscious or an unconscious state, according to the level of tension at the moment. Thus the touch of a feather will at one moment cause a conscious reaction; the crash of a bullet at another moment will cause none.

40. It is because sensations have been referred to sense-organs, and because attention has been fixed on the objective stimuli, that the term *impression* has come to be the equivalent of sensation, and sensation has come to be regarded as a physical not a psychical process. I have already argued that from first to last it is a physical process if regarded objectively, as a change in the molecular movements of the organism; and a psychical process if regarded subjectively as a change in Feeling. An improved Physiology and an improved Psychology have rendered this view necessary. Let Prof. Bain be cited in point. He expressly declares that "every fact of consciousness has two sides—one Feeling, the other Intellect or Discrimination. Some of our conscious experiences show the side of Feeling in the ascendant, and the side of Discrimination at the minimum; these, by courtesy, we call Feelings. So with the converse. When Discrimination is in the ascendant, Feeling is in abeyance and is practically non-existent, in reality it is still there but in a feeble form." (*The Emotions and the Will,* 1875, p. 558.)

Although in this passage the reader will note certain points of difference from what I have urged, and especially the important difference of limiting the elements to two, excluding that of Motor-impulse, yet the fundamental position is in perfect agreement with the one adopted in these pages; and if Prof.

Bain lays the whole emphasis on the radical identity of Sensation and Thought, the element he disregards, namely that of Volition or Motor-discharge, may be found amply recognised in the efforts of physiologists and pathologists to show the indelible connection of Sensation with Motion. But of this anon. What claims attention here is the recognition in Sensation of processes which usually are assigned to Intellect, so that when these terms are used in opposition to each other we are to understand simply the relative degrees of predominance of the Stimulation and the Reaction. A neural process is set going by some external cause. This process, according to the retinue of nascent processes which accompanies it, may be either an unconscious or a conscious change: it necessarily involves peripheral, central, and motor excitations, but involves these in varying degrees, and has for resultant either 1, a *sensible component*, or 2, a *sensation*. The process may not produce an appreciable change of consciousness, nor an appreciable movement. It may produce an appreciable change of consciousness with no appreciable movement. It may produce an appreciable movement with no appreciable consciousness.

41. Although sensation is thus a resultant, a function of three variables, stimulation, grouping, and motor-impulse, we employ the term habitually as a shorthand expression for the first only, and, moreover, confound it with mere impression. But a moment's reflection convinces us that the agitation of the auditory nerve by aërial vibrations is not a sensation of sound, though every one calls it so. There must accompany this agitation a central re-

action:—a reflex of Attention must be excited, otherwise no sensation is felt. Not only so, there must be an act of discernment, of classification of like and unlike, a distinguishing of one group of neural units from the others, before we can feel *this* sensation. How is the vibratory effect of a sounding violin distinguished from that of a bassoon, or the bark of a bull-dog from the bark of a terrier? Not by the ear alone; the child hears no such difference, although of course differently affected. In the early experiences of the child even the difference between a sound and a sight was not marked—both were excitations of the Sensibility; but were vague waves diffused throughout the organism, not waves restricted to definite pathways.

42. It being obvious that the sensation of a particular sound is not simply the response of the auditory tract, the ready explanation has been that sensations are mental states, and sounds are heard by the Mind, not by the Ear. It is Mind, and Mind alone, which can perceive the differences of different impressions. I assent. But I then ask two questions: First, Is Mind anything more than the sentient organism under a special point of view of its activities? secondly, and this question has a direct issue from the former, Why have all attempts to exhibit the relationship of Sensation and Thought been regarded with such profound repugnance, and stigmatised as Materialism? Assuredly it is a crass absurdity to exhibit Thought as a mode of Sensation, when Sensation is postulated as a bodily state, and Thought as a mental state; but this absurdity vanishes directly we postulate that Sensation is a

mental state under the same aspect that Thought is a mental state; and that under the obverse aspect both are bodily states. In other words, both are functional activities of the sentient organism, involving the same structural conditions, the same laws of reaction, and differing only in the different proportions in which their elementary factors are combined. To the physiologist, regarding the organism objectively, sensation and thought are bodily states. To the psychologist, regarding them subjectively, they are states of Feeling. Both as bodily and mental states their difference can only be due to the elements combined, namely the neural units and sentient tremors, and to the modes of their combination. The special character of every mental fact being, as we have said, determined by its predominant factor, so that in Thought the elements of Sensation and Volition are inconspicuous, in Sensation the elements of Thought and Volition are inconspicuous, and in Volition the elements of Sensation and Thought are inconspicuous; we apply this method of discrimination further, selecting the more conspicuous factor in Sensation, namely the stimulation of a sense-organ by some external cause, and by it designate the complex process.

43. The reader who has been dissatisfied with the foregoing statements may perhaps be convinced by a presentation of the intellectual elements which are involved in Perception. This is a phenomenon intermediate between Sense and Intellect. It is unquestionably a mental fact; unquestionably it embodies sensations, past and present. Although always excited by some stimulation of a sense-organ,

it always involves more than that; and it is usually distinguished from Sensation by its overt reference rather to the objective cause than to the subjective feeling. We are said to perceive coloured, figured, solid objects, but to have sensations of colour, figure, solidity. True, indeed, that we may also have perceptions of colour, figure, and solidity; nay, more, we have conceptions of these. But here the feelings are regarded as phenomena—objects of consciousness.*

Because the perception differs from the sensation in its overt reference to an object, and is therefore something more than the simple affection of Sense, most writers consider that the physiological process ceases with the simple affection, and that the psychological process begins with this "something more,"—which something is the co-operation of the Mind. But this, according to the views for which we have argued, is entirely to misconceive the relation of Physiology to Psychology, and to overlook the fact that the "something more" is the aroused retinue of nascent excitations, if we view the phenomenon on its physiological side, or the revival of associated sentient states, if we view it on the psychological side. To establish the distinction between sensation and perception as that between physiological and psychological processes, is to eject sensation from the mental sphere altogether. When men know, or think they know, the organic basis of sensation, and can assign the act to a well-defined organ, they are content to call sensation a physiological process. But not knowing *where*, not definitely imagining *how*, intellectual processes are effected, they are no longer satisfied with calling these physiological, but drop the organism out of sight, and invoke a new agent. The 'co-operation of Mind' is not the co-operation of some activity which is distinct from the sentient organism, it is simply the co-operation of the organism with a particular organ; and *without* such co-operation no physiological, no psychological product is possible.

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* How a state of feeling, an integral element of the Mind, can become an object to the Mind, seeming to have existence apart from it, is one of the most delicate of problems. For the present we must content ourselves with the fact that feelings do thus appear. And by way of prompting the reader's meditation, let the analogous question be suggested: How can the throb of the heart, or the movement of a limb, be felt by the organism of which heart and limb are integral elements?

44. We need not here discuss the law propounded by Hamilton (previously stated by Kant: see his *Anthropologie*, p. 139) that Sensation and Perception vary inversely, because its significance entirely depends on the definitions. A more instructive question is that often raised by opponents of the experiential school, namely, how it is possible to perceive Relations which never could have been given in Sense? Our answer is to deny the asserted fact; the assertion only seeming plausible because of the arbitrary limitation of Sense to the process of stimulation without regard to the process of Reaction. Relations *are* given in Sense, in so far as their Related Terms are sensible affections. But because we abstract the relations from the terms, name them apart, and consider them independently, we are easily led to conclude that they exist apart, and as such are obviously not given in Sense. We cannot see abstractions, but we see the concretes from which they are abstracted. We are incapable of seeing

Growth, Life, Causation, &c., but not incapable of seeing all the visible signs grouped and personified in these notions.

45. In a former chapter it was shown how and why perceptions are determined by pre-perceptions so that the Reaction involves the residue of past experiences, and thus displays the co-operation of the modified organism with the excitation of the organ. The same is true of Sensation. The organism is modified more or less by every sensible impression. Thus it is that sensations are evolved in a nidus of previous affections. There is therefore always a stirring of prior impressions even with the simplest sensible affection.*

46. While we must thus on the one hand class Perception under the same order of processes as Sensation, on the other hand we cannot dissociate it from the class of processes named Judgment, or Intellect. This is clear not only on physiological grounds in which the process of Grouping is manifest; but also on psychological grounds which disclose the process of Inference. Perception involves

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* "When a child experiences for the first time the sensation of scarlet [more accurately when it is for the first time impressed by the external stimulus], there is nothing but the sensibility of a new impression, more or less intense according to the intensity of the object and the susceptibility of the mind. It is very difficult for us to realise or define this original shock, our position in mature life being totally altered. . . . The process of engraining impressions on the mind after repetition gives to subsequent sensations a character quite different from what belonged to the first. The second shock of scarlet, if it stood alone, would doubtless resemble the first, but such is the nature of the mind that the new shock will not stand alone, but restores the notion, or idea, or trace that survived the other. The sensation is no longer the primitive surprise, but the coalition of a present shock with all that remains of the previous sensations."—BAIN: *The Emotions and the Will*, p. 559.

judgment. When we perceive distance, we are judging from certain appearances; and only by previous experience can such data lead to this conclusion. When we perceive an object, we infer that conjoined with the sensible quality now felt there are sensible qualities which will be felt under certain conditions. Now this inclusion of past with present affections in a group is the process of judgment, whether the included data be symbols, signs, or unconscious tremors—ideas, sensations, or sensible components. When I say "Augustus Cæsar was a wily politician"—"The battle of Arbela was decisive"—"That sound is the railway whistle"—"That coloured object is a geranium"—"I feel cold"—these phrases condense a vast variety of experiences by a logical process which is the same throughout. Hearing the railway whistle, seeing the geranium, and feeling cold, would not, indeed, be usually termed judgments; the two first would be termed perceptions or inferences; the last a sensation from which all inference is absent. But what is inference if not the partial arousing and comparison of former excitations? And is there not a very complex assemblage of that kind present in the discrimination of the sensation as that of cold, and of myself as feeling it, *i.e.*, of the change suddenly occurring in my consciousness?

47. The point here brought forward has been decisively seized by Prof. Bain, not only in the passages already quoted, but in the very definition he gives of that "attribute of our mental constitution" named Thought, Intelligence, Cognition; for the first element noted as implied in this attribute is "*Discrimination*

or the *sense* of difference shown by our being conscious of one sensation as more intense than another, or when we are aware of two feelings as different in kind"; and the second element is "Similarity or sense of agreement." That these elements are also implied in Sensation would require no argument, were it not for the tradition of applying Discrimination only to ideas and objects, not to all sentient changes. No one would dispute the statement that an animal or an infant feels differently when differently affected, and similarly when similarly affected, yet most persons would deem it a paradox to say that the animal or infant *discerned* such difference and similarity. Yet it is evident that the feeling of a difference is the sole basis and chief content of its discernment.

48. In relation to the argument that Sensation and Thought both have their seat in the Sensorium, not the one in peripheral organs the other in the brain, it is to be observed that Sensations, originally due to stimulation of a sense-organ, may subsequently arise in the absence of such stimulation, may thus arise when the organ has been destroyed. I refer to subjective sensations and hallucinations. These may be interpreted by extending the conception of a sense-organ so as to include its central termination in the brain. I do not think there would be anything gained by this for our present purpose, because the isolation of an organ from the organism is impossible physiologically. But waiving this point, let us dwell on the decisive fact that a sensation of colour may be distinctly felt under conditions which prevent the entrance of rays of light into the eye. This has been curiously illustrated by Helmholtz, Wundt, and Delbœuf.

A piece of green paper is exactly covered by a piece of transparent white paper; the latter appears greenish owing to the shimmer through it of the under-green. A piece of grey paper, about the size of a wafer, is then inserted between these two. The normal colour of such a grey spot seen through white transparent paper will be that of a dull white; but here it is neither grey, nor white, nor greenish, but rose-red. Perhaps you think that it is owing to the eye being stimulated by the green ground that this rose-red appearance is due? Not so. For leaving the papers just as they are, the rose-red appearance vanishes directly you bring another piece of grey paper near the first, but *on* the thin covering paper instead of *under* it; having seen the rose-colour vanish thus, you see it reappear directly the second piece of grey paper is removed. That the colour is not produced by the direct stimulation of Sense, but by the indirect stimulation of an unconscious judgment, is the paradoxical explanation of this surprising fact. Let us consider the following experiments in this light.

49. The white wall of a room with closed shutters is illuminated from two small openings in the shutter; one of these openings admits the white light of day: we will mark it W; the other admits only the red rays of the light which passes through a coloured glass: this we will mark R. Placing a stick so as to intercept the light from both openings, we observe two shadows on the wall, namely the shadow *w*, which is only illumined by the white light from W, the red rays being intercepted by the stick; and the shadow *r*, which will be red from R because all the white light is intercepted. The white wall, being illumin-

ated from both sources, appears of a pale grey. The shadow *w* ought also to appear grey, since it is illuminated only by the white light of W, and a shadow thus formed should be grey. Instead of this it appears as an intense green. If now the red glass be removed from the opening R, the shadow *w*, although still illumined as before from W, is no longer green but grey. Place a green glass at the opening R, and the shadow *w* will change to red. The first explanation which suggests itself to you is that the effect is due to the diffused light. But repeat the experiment with some variations. Look at this green shadow through a narrow tube which just enables you to see the shadow without at the same time seeing its illuminated edges: by this means you cut off the influence of the diffused light. Nevertheless the shadow is still green. Now while you are looking through this tube some one removes the red glass from R. If you are asked, What is the colour of the shadow? you answer green. A blue glass, a green glass, a yellow glass, is substituted, but no matter what the nature of the light admitted, you still see the shadow green. Obviously then this green colour is not a simple retinal affection: none of the normal conditions for seeing green are present, yet instead of grey, blue, yellow, or red, you persist in seeing green. Is this because the retina has been so affected that it can only respond in this way? Not in the least, as is proved by these experiments: the coloured glass is removed from R, and the tube is laid aside; the shadow *w*, then, is grey. You again look at it through the tube; it still is grey. While you are looking some one replaces the red glass, and afterwards substitutes the green glass, but still you see the shadow grey. Thus under precisely similar conditions of retinal stimulation the effects have been contrary: the shadow is green in the one set of experiments, and grey in the other. Now once more return to the original conditions and place a red glass at the opening R. The shadow *w* reappears green. You know that as you look at it through the tube it will continue to be green even after the red glass has been removed; but if you happen to move the tube a little on one side, so as to embrace a portion of the illuminated wall, this green shadow instantly becomes grey. On once more adjusting the tube so as to exclude the wall and embrace only the shadow, you expect of course to see the shadow once more green—since it was green before you moved the tube. But no: the shadow is grey; and it is still grey even when the red glass once more covers the opening R; that is, so long as you keep the tube unmoved, but if you move it so as to include a portion of the wall the shadow reappears as green.

50. For the purpose of the present chapter it is enough that these experiments prove that even in sensations of colour, commonly held to be simple affections of the retina, or simple impressions on the organ of sight, there is involved such a co-operation of the sentient organism, such a reaction of the Sensorium, as would if considered by itself be termed an intellectual act, a judgment. Nor is this anything but what our principles would deductively lead us to infer. Sensation, we constantly repeat, is not a simple but a highly complex state: it is a feeling which is the resultant of various components, one of

these being what is called the stimulation of a sense-organ; and the others being those classed under sensorial reaction. The particular character of the resultant feeling is of course dependent on the reacting centre; and *if at any moment there are present the conditions which dispose that reaction to take the form of a particular sensation, these conditions will predominate* over the effect of the external stimulus.

51. Now in the experiments just cited it is evident that the sensations have not been wholly due to the stimulation of the retina; and we are led to ask, What was the kind of sensorial influence which determined them? Delbœuf, in agreement with Helmholtz and Wundt, offers this explanation:—

Our senses are directed towards the objects and not towards the subjective modifications they impress. One great sign of an object is its colour, and we are incessantly exercised in recognising this colour under all sorts of modifications of light. We abstract this colour from its variations; so that, for example, when we see the object reflected by a mahogany table, we see it in what we call its true colours and not suffused with the brown tints of the table. In this way we learn to see, that is to judge, green through red; although physically speaking green seen through red ought to appear greyish, "mais notre jugement redresse cet effet; comme nous voyons que le gris qui frappe notre œil est perçu à travers le rouge, nous en *concluons* que ce gris provient nécessairement du vert, car le vert seul est vu gris à travers le rouge. Ici l'exercise, l'habitude a *rectifié* l'impression faite sur nos sens. Mais dans l'expérience que nous avons instituée cette même habitude engendre l'erreur. Nous jugeons verte l'ombre qui est en realité grise, uniquement parceque nous nous figurons la voir à travers la lumière rouge, puisque le rouge est la lumière ambiante. Une fois que nous l'avons jugée verte, si nous plaçons notre tube il n'y a pour nous aucune raison de changer d'avis; et il n'existe pas davantage de raison quand on supprime la vitre rouge, *puisque nous n'éprouvons aucun changement d'état.* Mais la vitre rouge étant supprimée et notre tube écarté, nous jugeons que la tache est grise parceque nous croyons l'apercevoir à travers la lumière blanche." (*La Psychologie comme science naturelle*," p. 62.)

52. The explanation amounts to this: The sentient mechanism is 'set' in the attitude of response to the conditions, real or imaginary, which on numberless previous occasions have had this effect. I say "real or imaginary," meaning the actual stimulation of a present impression, and the anticipated stimulation: both are real as regards the change of sentient state; but the one change is consequent on the present stimulation, the other on the revival of its residua—the one is a sensation, the other an idea. Probably the reader is quite familiar with this fact of ideal stimulus, and will, therefore, at once understand an observation of Wundt's, who when experimenting on the time requisite for perception found that if a given movement was to follow a given signal, the movement would frequently be made by the person experimented on, even when its actual signal was withheld: the attitude of expectation was set, and then the discharge took place without peripheral stimulation. In like manner, the attitude

of the mechanism once set in the direction of a particular colour, that response was independent of the slight changes in the actual stimulation. A particular colour is seen because it is imagined; it is imagined because its normal conditions are supposed to be present.*

53. The effect of imagination on sensation has often been noted. How far the statements respecting patients under mesmeric or hypnotic influence are incredible, or only exaggerated, need not here be discussed; whether we believe or disbelieve that water can be made to taste like wine or like physic, when the mesmeriser declares that the water is wine or

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* Classen observed that when he allowed sunlight through a dark-red glass to fall on the side of his retina the dark carpet of his floor became in a few seconds a brilliant sea-green. This effect he attributes to the secondary feeling of complementary colour excited in neighbouring retinal fibres by the intense excitation of the fibres at the side on which the light fell (*Physiologie des Gesichtsinnes*, 1876, p. 149). But this hypothesis of retinal irradiation is in direct contradiction to the law of isolated conduction; nor have we any evidence whatever for supposing that the excitation of one fibre can be propagated by cross action to neighbouring fibres; whereas there is ample evidence of the irradiation taking place in the great plexus of the Sensorium. Taking this very case as our text, let us ask, Whether the reaction of the Sensorium was not the cause of the carpet appearing of a brilliant green? Had he closed his eyes immediately, instead of keeping them fixed on the carpet, no such effect would have followed, yet the retinal irradiation would then have had free room. When a red is placed on a yellow ground it takes on a bluish tint, and the ground takes on a faint greenish shimmer. This is explained as the action of the inducing colour on the induced colour; but it does not consist in one set of retinal fibres acting on a neighbouring set: each acts on the centre, and there the sensation arises—one excitation is alternated with the other so rapidly that each colour is felt in relation to the other. In the rapid alternations from yellow ground to red spot, and from red spot to yellow ground, there is a lingering *after feeling* which is carried over from one to the other. If any doubt hovers over this explanation of the coloured shadows as due to central irradiation, it may be dispelled by the marvellous facts of Double Sensation, wherein we see one sensation inducing another of a totally different kind, originally due to a different organ.

physic, we cannot doubt the familiar effect of suggestion when we observe how one and the same sapid substance will be agreeable or disagreeable, according to our mental attitude.* There are many of our pleasures which would be pains if they were not called pleasures, and sought in expectation of delight.

54. With reference to the hypothesis of unconscious judgment operating in sensation, I admit that the demarcations of language are obliterated by such wresting of terms from their conventional application; but it is none the less true that no consistent theory of the mind can be reached unless we start from the fact that all its processes are fundamentally the same. We must therefore reject the idea that Sensation is one process in one organ and Judgment another process in another. The facts already adduced show how a false judgment will produce an illusory sensation, just as an imaginary suggestion will reverse the quality of an actual impression. The question therefore which now arises is: What is the process of Judgment? and, following upon this: What is the logical process in Sensation?

Judgment has already been expounded. If we compare the logical operations in Thought and Sensation we find them both expressed in the discernment of difference and resemblance; by this the neural units are grouped; and the grouping of these groups into higher unities is the *conclusion*. The analytical exposition of a judgment presents major and minor premiss blended into a third group by what is called the act of concluding, or judging; a similar analysis of the perception of distance, the recognition of an object, the discrimination of an impression, may also be thrown into this form of complex experiences grouped into a conclusion. Men do not reason syllogistically, although they may throw their reasonings into the syllogistic form. They do not judge by major and minor and copula, but by a single act of intuition grouping neural units. It is thus also they perceive; thus they feel. In all cases there is the excitation of one group *through* another, so that the two become one. In illustration of this process let us consider the interesting case of

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* Gratiolet relates that when two medical students were engaged in dissection, one playfully passed the handle of his scalpel across the finger of his friend, who started, shrieked, and then, laughing at his error, confessed that he felt the pain of the blade cutting through to the bone. (*De la Physiognomie*, p. 287.)

DOUBLE SENSATION.

55. The following case is of intense psychological interest.* It reports what the narrator observes in himself, and in his brother; and the main facts have been controlled and verified by Prof. Brühl, so far as objective verification is possible in such a case.

Herr Nussbaumer and his brother from childhood upwards have always had sensations of colour simultaneously excited by sensations of sound. It is not simply that sonorous vibrations excite colours accompanying the sounds, but definite sounds excite corresponding definite colours. One of the brothers has a great facility in distinguishing the overtones which accompany the ground tone; yet very often when these overtones are delicate and breathlike, his perception of them is *somewhat disturbed by*

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* See *Wiener Medicinische Wochenschrift*, 1873.

the accompanying colours. Both brothers have been accustomed to designate particular tones by their attendant colours. The shrill womanly tones of some men's voices they call yellow; the rasping voices of some others they call greyish brown. When they were children it often occurred that some particularly agreeable tone made them exclaim, "What a lovely colour it has!"—which naturally excited the laughter of bystanders. In later years Nussbaumer learning that painters spoke of the tones of colour, and musicians of the colour of tones (*klang-farben*), imagined that they also had the double sensation which he noticed in himself. But he learned on inquiry that this was not so; their terms were metaphorical.

56. To settle the question whether this double sensation was 'mere phantasy,' or 'association of ideas,' Professor Brühl tested Nussbaumer, and ascertained first that each particular note had constantly its corresponding colour; and secondly, that both brothers agreed in having the double sensation, but not precisely the same colours corresponding to the same notes—there was a general agreement, but with this some differences. The brothers had been separated for six years, during which period no communication on this subject passed between them. The one in Vienna, at the instigation of Professor Brühl, wrote down a score of questions, which the brother in Vicenza was requested to answer; these answers were handed in a sealed packet to the professor, in whose hands were the questions and answers of the Viennese brother. In the article from which I draw this account both questions and answers are

given. They show that the phenomena are constant in both brothers, in spite of the minor variations. Thus the tone *g″* has orange for one brother, and orange-yellow passing toward bluish for the other. The tone *e* has dark blue for one brother, and leathery yellow passing over into cornflower blue for the other. *D* has a mingling of dark blue and brownish violet for one, and chestnut brown with bright streaks for the other. When a chord is struck, one brother has a blending of colours passing from dark to bright, and from bright to dark; the other has a vividly changing mixture with sudden flashes of particular colours.

It is specially noticeable that red, green, pure white, and pure black are never excited in either of them by any tones or combinations of tones. Blue, yellow, brown, and violet are the most frequent. The brother at Vicenza writes: "I don't know why you put the questions, nor what interest the answers can have for any one but ourselves. I only know that if I were a painter and a musician I could make colours represent every tone, and tones represent every colour, discords included."

57. Further, not only do colours accompany objective sounds—those caused by sonorous vibrations—but they also accompany subjective sounds. When dreaming, if the brothers hear a trumpet or a drum, a shriek or other loud noise, there arise the same corresponding colours as those which arise in waking hours.

In answer to the suggestion that it is "owing to Imagination," the writer says this can hardly be the explanation, for in the first place it was noticed by him when he was only four or five years old, and in the next place Imagination is unable to picture red, green, black, or white, when sounds are heard. He has vainly tried to call up the subjective sensation of red; once he did succeed with green, but has never been able to repeat it. He cannot say what are the gradations of colour he finds in tones, because he must first hear the tones before he can name the colours, and very often not even then, because the colours are not such as he can name, he having never seen them objectively. He may remember to have seen the kind of colours but not these particular shades. Also a tone which has overtones sometimes appears in one shade of colour, sometimes in another, according to the strength of the overtones.

In ordinary life this accompaniment of colour is neither agreeable nor disagreeable, yet on some occasions, as in listening to a symphony, it will amount to a serious disturbance. He can, however, by an effort of concentration, rid himself of this incubus of colour, to attend only to the sounds.

58. Since becoming acquainted with this curious case I have sought far and wide for other examples of double sensation. But people are so little accustomed to note peculiarities in their sensations, unless these have some objective significance, that I could learn little. The following is taken from "Nature" (of May 17, 1877), where a correspondent says: "While lying awake a few mornings ago *with my eyelids closed* I was startled by a railway whistle. At the same instant I perceived a blaze of light on a dark ground, seemingly a few yards off. I made inquiry of my wife, who is of a much more nerv

temperament, if she had ever observed such a coincidence, and was informed that in her case it is not a very infrequent occurrence." None of his scientific friends could tell him of cases of sounds exciting the sensations of colour. This is only an approximation to the Nussbaumer case; and it is an abnormal not a normal coincidence.

Many years ago a friend informed me that a glorious vision of flowers springing up in lovely tumult always accompanied a peculiarly powerful and pleasurable sensation. Mantegazza knows a man who cannot taste vinegar without at the same time having a sudden sensation of cold at the back of the neck. Every one knows the sensation in the forehead when hastily swallowing ice, and the "setting the teeth on edge" by scratching glass. A terrible sight always makes my legs feel cold, just as a horrible smell excites nausea.

59. Reflecting on Nussbaumer's case in the light of the few other analogous cases I could hear of, I began to consider whether the conjunction of two very different sensations was after all anything peculiar, whether, stated in more general terms, the normal process was not always that of one excitation being accompanied by nascent excitations, one feeling by other feelings; so that all individual peculiarities must be assigned to the kind and energy of these concomitants. Introspection will serve to assure us that every sensation has such an escort, which varies in energy and success; but since for the most part this retinue of subordinate excitations has no practical interest for us, it is disregarded, or only regarded when it has exceptional energy; just as we only

notice the effect of sensation on the heart when the throb is energetic (and not always then), although it is demonstrable that every sensation does affect the heart. The Nussbaumers have other nascent states besides the more distinguishable states of colour, yet for some reason only these colour states appreciably emerge. I have many other feelings of various energy besides that of coldness in the legs when a horrible object is seen; but it is this coldness which obtrudes itself on my notice; probably because my attention having once been directed to it as peculiar, I have henceforward become accustomed to single it out. The Nussbaumers may in like manner have, so to speak, cultivated the habit of singling out the excitation of colour-feelings; though of course there must be some individual peculiarity in their organisms which renders the excitation of colour-feelings more definite and energetic than is common. This allowed for, let us try to picture the process. The organ of Sound is not only different from that of Colour, but the central terminations of the auditory and optic nerves (so far as any termination can be anatomically surmised) are wide apart. There is also an independence in the action of the two organs; one may be wholly absent without involving any loss in the other. A stimulus excites the auditory nerve and centre, the Sensorium responds in a sound. A stimulus excites the optic nerve and centre, the Sensorium responds in a colour. But if the response of sound is to replace the stimulation of the optic centre, it can only be in one of two ways: either there must be a path of communication between the two centres, so that the agitation of the one sets the other in action, or the

Sensorium, in which both centres penetrate and lose themselves, giving up to it their energy, is alternately set in the attitude of sound and colour, and this so rapidly that the two responses seem simultaneous. In either case we have to account for the fact that this pathway, or this alternation, rather than another, has been established; for it is not a primordial disposition of the mechanism, nor is it a disposition which is generally acquired. The laws of Sensibility necessitate the irradiation of every excitation throughout the system, and the restriction of its discharge to the path of least resistance; and singular as may be the case of the Nussbaumers it is only a case of those general laws, and is not more unintelligible than the familiar fact of an optical impression being accompanied by a revival of tactual and muscular feelings, and the perception which results being accompanied by the auditory and articulatory feelings which form the name of the perceived object. To see an apple is to have a complex of sensibilities simultaneously excited; to see an apple, and mentally or vocally to utter the word, is not only to have a complex excitation, but to have two widely different portions of the organism simultaneously active. Between the verbal apparatus and the visual apparatus there is even a greater anatomical distinction and physiological independence than between the auditory apparatus and the visual. If the combination of vision with speech is characteristic of the human organism under present social conditions, and if the combination of sound with colour is an individual peculiarity, the two combinations follow the same law.

60. This topic might be pursued further, but for our present purpose enough has been said in illustration of the position that even in Sensation may be discerned the operation of processes which are commonly assigned exclusively to Intellect. The mechanism of Judgment is the grouping of premisses, the inclusion of diverse experiences in a single expression. While it shuts in (concludes) it by the same act shuts out—detaches the formed group from all its surroundings. This also is the mechanism of Perception, which groups manifold experiences and detaches the group. We cannot perceive a stone without detaching it from the ground, from other stones, plants, sky, &c., which solicit Sense at the moment. We must class the stone as well as detach it. Finally, this also is the mechanism of Sensation. Sensible impressions are grouped, detached, and classed.

Aristotle assigned Discrimination and Judgment to the sensitive soul; * nor do I see how otherwise sensation can be admitted among mental states. And again, unless the conditions were present in Sensation, it would be difficult to admit them in Imagination, Memory, and Ideation generally. Whether the mental state be that of direct reaction or of indirect reaction—of Sensation or of Ideation—the quantitative differences in neural units must produce differences of feeling; and on differences and resemblances all judgments are based.

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* *De Animâ* III. 9. compare *Analyt. Post.* II. 19.

CHAPTER V.

AFTER-SENSATION.

61. SENSATION being defined the Mode of Sensibility determined by the actual contact of a stimulus as its objective cause, there is need of a term for another form which *persists* and *fluctuates* after the contact ceases, and *recurs* without the recurrence of the contact. We may name it After-Sensation, to mark its specific quality, and its relation to the objective origin. We thus distinguish it from Subjective Sensation as species from genus; and from "internal sensation" as species from species. The objective sensations are assignable to external causes; the subjective to internal causes; but although the sensations arising in the viscera, from changed conditions of the blood and other internal causes, have the peculiar quality of Sensations arising from external causes, it is needful to have a term which marks the difference between the sensation (say of yellow) originated by the action of a yellow object, and the same sensation originated by having taken santonin, and due therefore not to an external but to an internal cause. This is still more the case when the sensation originates in a suggestion, or other mental process, as in Hallucination. Here it is peculiarly subjective. But no matter what the cause, the

sensation itself must obviously be an excitation of the neural group which is its physiological equivalent. It was originally produced by objective stimulation; it may be reinstated by subjective stimulation. The reinstated group is however never *precisely* the same as the original: the neural units have quantitative and qualitative differences in the two cases. It is to mark a special class of such differences that the term After-Sensation may be used. A sensation which persists after cessation of contact is very like the sensation during contact, but is nevertheless quite distinguishable. There is not the same energy of vibration. Indeed it is impossible that this energy should continue unchanged, for it is not unchanged even during the actual contact of the stimulus: the energy has a culminating and decreasing curve, and is finally reduced to zero if the contact continue unchanged. Hence we conclude that the real influence of contact is simply that of disturbing the neural equilibrium, liberating the energy of the neural tract; and the continuance of the disturbance is independent of the stimulus, and dependent on the statical conditions of the stimulated organ.

62. Helmholtz (*Optik*, p. 337) compares the persistence of sensation after withdrawal of the stimulus to the persistence of contraction of a muscle after the electric shock has passed through it. The contraction does not begin until after the lapse of about the sixtieth of a second; and a much longer time elapses (the sixth of a second) before the contraction ceases. The duration of a luminous sensation after withdrawal of the light is proportionate to the intensity of the stimulus and the unwearied state of the retina. To these I

should add a third factor, namely the unoccupied state of the Sensorium.

63. Here let a word be placed respecting the popular hypothesis of "vibration" as the mode of neural action. I have already said that there is no objection to its use if we understand by it simply a way of rendering the process picturable; but many objections if we employ it as a basis of deduction, and interpret the actions of a sentient mechanism by "laws of vibration" formulating the action of elastic bodies. Consider these cases: when an elastic body is made to vibrate in unison with some other body, it takes on the rate of vibration characteristic of the latter, but resumes its own rate of vibration when the other body ceases to affect it. Not so with the nervous system. If a bar of iron be placed in the magnetic field an appreciable time elapses before it is magnetised, and when removed from the field it continues awhile to retain its magnetic state; this *residual* magnetism slowly subsides. Here we have an approach to analogy with the nervous system; but only an approach, for unlike the residual magnetism, the residual neural energy has the quite peculiar property of *alternating* between subsiding and resurging vibrations—now slowly dying till it almost vanishes, and now suddenly flaming up with renewed vigour.

64. We must understand therefore that the vibrations of the neural process, if vibrations these are, have a law of their own—a special mode of persistence.

> Music when soft voices die
> Vibrates in the memory.

The rapidly moving spark leaves behind it such a trail of tremors fused into one continuous feeling that we seem to see not a moving spark, but a luminous line. The clang of a trumpet which seems to cease immediately because replaced by some other sound—the voice of a friend or the murmur of insects—will continue to be faintly heard at intervals if we attend; and the voice of our friend, though now silent, alternates its faint murmurs with the dying echoes of the trumpet.* That the vibrations persist long after the stimulus has ceased explains how Volkmann could read a word of several letters seen in the flash of an electric spark which lasted only the 4000th of a second: it was these persistent tremors which enabled him to spell the word. The same explanation must be given of the familiar fact that we sometimes hear the words spoken to us at first quite indistinctly and a few seconds afterwards hear them correctly, just as we pass an acquaintance in the street, seeing yet not recognising him, and presently interpret the vision as in a flash.

65. Purkinje says that after looking fixedly for

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* Prof. YOUNG relates his experience with intense Leyden jar sparks of from 7 to 9 inches long and of dazzling brilliance. "When, in a darkened room, the eye is screened from the direct light of the spark, the illumination produced renders everything in the room perfectly visible; and what is remarkable, every conspicuous object is seen *twice* at least, with an interval of a trifle less than one quarter of a second—the first time vividly, the second time faintly; often it is seen a third, and sometimes but only with great difficulty even a fourth time. The appearance is precisely as if the object had been suddenly illuminated by a light at first bright, but rapidly fading to extinction, and as if while the illumination lasted the observer were winking as fast as possible." The explanation suggested by Prof. YOUNG is that of a reflexion of the nervous impulse, as if the intense impression on the retina were reflected back again from the brain to the retina and thence again to the brain renewing the sensation. *American Journal of Science and Art*, April 1872.

twenty seconds through a window at a grey sky, he covered his eyes with his hands and in the darkness appeared the ocular spectrum of the window with its white squares of glass and dark framework. This was simply the persistence of the original state under subsiding energy. Presently the scene changed. The white squares vanished, giving place to squares of darkness, the framework becoming gradually bright. This alternation of light and dark was repeated four or five times. (*Beiträge zur Physiol. des Gesichtsinnes*, 1823, I. 105.) How unlike this is to any known phenomena of vibration in elastic bodies!

The other morning, after looking through the window I turned aside and looked at the objects in my dressing-room. As I was not attending to any physiological subject, merely occupied with dressing, I was not in the least conscious that the luminous effect of the bright window was still faintly present. The fact was forced on my attention by the sudden appearance of the ocular spectrum when I sponged my face: the glass panes appeared of a troubled darkness, the framework standing out in bright lines. Had I closed my eyes, shutting out all fresh stimulation, on turning from the window, this would have been the spectrum which would have appeared *after* the subsidence of the original vibrations. Hence we must conclude that the vibrations pursued their regular course *under* the superposed vibrations caused by the objects in my room; or, if they ceased on the new stimulation, and were replaced by vibrations due to the objects, then we must conclude that the force of the stimulus left behind it a residual *tendency* to vibrate in this direction.

66. Not only is there a resurgence of energy, there is also a *recurrence* of state at briefer and longer intervals. This is the process in Memory, Reproduction, Association, Suggestion. The vibrations are reinstated in the absence of the original stimulus. The causes are various. Sometimes the effect may be assigned to an increased excitability of the organ, sometimes to a more general tendency.

At the Leeds Meeting of the British Association, Professor Stevelly narrated the following anecdotes: —At the close of the last college session he had been in weak health, and had gone out to his brother-in-law's seat in the country for a few weeks. While there he had become greatly interested in the economy and habits of the bees. "One morning, soon after breakfast, the servant came in to say that one of the hives was just beginning to swarm. The morning was a beautifully clear, sunny one, and I stood gazing at the insects, as they appeared projected against the bright sky, rapidly and uneasily coursing hither and thither in most curious yet regular confusion, the drones making a humming noise much louder and sharper than the workers, from whom also they were easily distinguished by their size; but all appearing much larger in their rapid flights than their true size. In the evening, as it grew dark, I again went out to see the beehive, into which the swarm had been collected, removed to its stand; soon after I was much surprised to see, as I thought, multitudes of large flies coursing about in the air. I mentioned it to my sister-in-law, who said I must be mistaken, as she had never seen an evening on which so f [illegible] ad. Soon after, when I retired to my chamber, and knelt to my prayers before going to rest, I was surprised to see coursing back and forward, between me and the wall, what I now recognised as the swarm of bees, the drones quite easily distinguishable from the workers, and all in rapid whirling motion as in the morning. This scene continued to be present to me as long as I remained awake, and occasionally when I awoke in the night, nor had it entirely faded away by the next night, although much less vivid. This was the first instance I had ever heard of moving impressions having become permanently impressed on the retina, nor can I give the slightest guess at the *modus operandi* of the nerve. Notices of fixed impressions, particularly after having been dazzled, are now common enough. The Rev. Dr. Scoresby, at the late meeting at Liverpool, had given a detailed account of some which had presented themselves to him; and a very curious one had occurred to me some years since. I was walking down the streets of Belfast with Sir John Macneill, the eminent engineer, when he said to me—'What has become of my old friend Green who kept that shop? I see new people have got it.' Turning suddenly to look at the shop indicated, I was completely dazzled by the bright reflection of the sun shining on the new brass-plate under the window of the shop, so that for some seconds I could see nothing. As we walked on, I soon observed before me in the air the words 'J. Johnstone & Co.,' in blood-red characters, which soon, however, changed to other colours. With an exclamation of surprise I stated the fact, and we turned back to see whether or not this was really the inscription on the brass-plate, and found that it was. The optical account of this was simple enough. The retina had been partially paralysed from the intense light reflected from the plate, but as I had turned with pain from it instantly, the *part corresponding to the black letters on the plate had escaped;* and as I walked on, the red strong light reflected from surrounding objects on this part became contrasted with the darkness, as yet showing itself on all the surrounding parts of the disordered retina: as the retina recovered its tone, other colours in succession took possession of the place which at first had been red. Sir J. Macneill then told me that when first he had gone to reside in London, a murder had been found out by a similar circumstance. The murderer, then unknown, had been dazzled by the reflection of the sun from a bucket of water which another man was carrying before him; and soon after seeing in the air what he took for a bucketful of blood going before him, he was seized with such horror that he declared himself the murderer, and disclosed such facts as brought the crime home to him, so that he was convicted and executed."

67. Not only will sensations recur owing to mental preoccupation or residual tendencies, but also to increased excitability from a nervous shock. I have known the shock of a railway accident in one case leave behind it a sensation of tingling in the extremities, and a persistent acid taste, which lasted with varying intensity for several days; and Charles Dickens told me that after the accident in which he nearly lost his life, he was haunted by the recurring sensation of falling on the side opposite to that on

which the carriage fell. To these let me add two cases cited by Sir B. Brodie. He had a patient who "after recovering from a concussion of the brain was in all respects the same as before, except that for a long time everything he ate had a bitter taste. A friend has informed me of a case in which after some unusual anxiety of mind every article of food produced a taste of intense sweetness, this continuing for many months."[*] Again: "A friend of mine swallowed by mistake nearly a wineglassful of tincture of quinine. The first effect was to produce some very disagreeable symptoms affecting the head, which however subsided in about twenty-four hours. These were followed by an inconvenient amount of deafness, continuing for several days. For some considerable time afterwards he was troubled with another symptom, the appearance of phantoms having the form of portraits of heads and faces with old-fashioned wigs, a large number presenting themselves at the same time in groups. These phantoms could be made to disappear by an act of the will, and might be conjured into existence in the same manner."[†]

68. Although it is the persistence and fluctuations of visual sensations which have attracted most attention, yet all the senses furnish evidence both of persistence and recurrence. I am not aware of any observations on Hearing, Taste, or Smell, which are analogous to those of the resurgence of visual sensations.

How much is due to a peculiar excitability of the

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[*] BRODIE: *Works*, 1865, I. 163. *Psychological Inquiries*, Part. I.

[†] Ibid., p. 309.

Sense-organ, and how much to the Sensorium, cannot easily be estimated. Probably in some cases one predominates, and in others the other. It is quite certain that the after-sensation may be centrally excited when the sense-organ is protected from peripheral excitation. Thus Newton found that when he shut the left eye and looked with the right at the sun, the spectral image of the sun was present in either eye. Only one eye had been directly stimulated, yet in both the sensitive state was altered.* Not only so. The spectra vanished, were replaced by other sensorial states, yet so profound had been the modification of his Sensorium, that long afterwards if he went into a dark room and fixed his thought intently "as when a man looks earnestly to see a thing which is difficult to see"—thereby invoking the muscular as well as the sensorial elements of vision—the spectra reappeared. After pursuing these experiments his Sensorium became so excitable in this direction that for months afterwards the spectra returned whenever he began to meditate on them.

69. Dr. Wigan relates that under circumstances of very painful emotion he heard a bell with a very peculiar timbre at Mola di Gaeta. He heard it only once. Yet in crossing Mont Cenis he caught a violent cold, and his ears became painful; with this

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* Mr. J. Z. LAURENCE experimenting on this subject found that if one eye be closed, and the bright sky be looked at by the other through a darkened tube, after a while the eye becomes fatigued and a smoky spectrum appears at the end of the tube. If the tube be now laid aside, and the sky be viewed by both eyes, a similar but much *darker* spectrum appears on the surface of the sky, and now, on alternately opening and closing each eye, a rose-coloured spectrum is seen with the fatigued eye, and a pale green spectrum with the other.—*Philosophical Magazine*, 1861, xxiii. 221.

there suddenly recurred the peculiar sound of the bell of Mola di Gaeta. "I was entirely convinced that I heard a bell; looked round for a campanile in vain, and tried with as little success to persuade my companions of the truth of my conviction. All the way from thence to Beauvoisin the same sound continued in my ears, renewing all the painful ideas associated with it, and it was not until I had sat for some time in a very hot room at Montigny that it ceased to annoy me. On resuming my journey the sound was renewed, and it was not till after a hot bath and free injection of the ears with warm water at Lyons that I finally got rid of the distressing delusion." *

70. Some years ago I was watching the gambols of two tigers, when one of them suddenly ejected his urine full in my face. The stench was indescribable, and so violently did it affect me that for several weeks I was constantly plagued by a recurrence more or less vivid of the sensation. It varied greatly in intensity from hour to hour and from day to day; but although it grew fainter and finally subsided, I had at any time only to draw the air through my nostrils with a strong inspiration to revive something of the original energy of sensation. At first nothing kept this peculiar smell permanently in abeyance except some stronger and unallied scent; and for some time after it had left me, any scent having the slightest resemblance to it sufficed to revive the memory.

The other day I was suffering from headache, and tried to soothe it by smelling strong liquid ammonia,

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* Wigan: *Duality of the Mind*, 1844, p. 66.

which was so pungent that it made my eyes water. During the rest of the morning I had occasional recurrences of this sensation even when walking in the flower-garden. At first it was so vivid that I suspected some ammonia was clinging to the moustache or the mucous membrane; but the rapidity of the transitions was irreconcilable with this explanation.

71. During several months of intense microscopic study of the spinal cord, the preparation and examination of sections had become so absorbing that even when away from my work-room my mind was constantly hovering round the subject, which became to me what the Stock Exchange is to the speculator. It followed me in long country rambles; it went to bed with me at night. Far from discouraging this companionship, I courted it. At last I began to feel uneasy. The general idea of the spinal cord and its mysteries of structure and function began to give place to the *image* of one particular section, which reappeared with all the vividness of actual vision whenever I closed my eyes on going to bed. I was not thinking of it, but *seeing* it, and studying its details precisely as if it had been under the microscope before me. Nor could I get rid of the vision; at least not permanently, it vanished only to reappear. And this was the trait by which it could have been distinguished from the sensation of an actual object. When present the feeling as feeling was indistinguishable from that at my work-table.

Sufficiently acquainted, at second hand, with such hallucinations, I was too well aware of their significance to indulge in them. A journey to Italy relieved me. Nay, I had no sooner crossed the Chann the changed conditions of my Sensorium prevented the recurrence. Two points are worthy of remark in this experience: the hallucination was not any disturbance of the normal retinal function nor of the normal cerebral function: there was neither an excess nor a defect of retinal sensibility, nor an excess or defect of cerebral activity. My vision was as healthy as before; nor had I any other visual hallucination; out of hundreds of sections, transverse and horizontal, from different spinal cords and different parts of these cords, only this transverse section through the lumbar enlargement of a woman's cord persisted in recurring before my closed eyes. I do not know that I had been more occupied with this section than with others, but I happened to have examined it under a stronger light; and thus while the general tendency of the mind was set in the direction of spinal cords, this slight predominance of intensity no doubt caused the one section to be revived in preference. The *suggestion* was thus twofold—a mental preoccupation, and a physical direction. When after crossing the Channel I ceased to occupy myself with nervous structure, this suggestion never recurred.

72. Henle relates that once when he had been working several hours in the morning at the microscopic examination of arteries and nerves, he found that in the evening if he rubbed his eyes, or coughed, or sneezed, there suddenly appeared a luminous image of the preparation he had been examining in all its details. This image replaced the flash succeeded by formless colours, which is the usual consequence of rubbing, coughing, or sneezing. In Henle's case the cause seems to have been purely an affection of the

sense-organ; no suggestion was in operation, as in my case, and in the following case narrated by Andral.

"Au début de mes études médicales," he says, "je fus vivement frappé de voir dans un des coins des salles de dissection le cadavre d'un enfant à demi rongé par les vers. Le lendemain matin en me levant et m'approchant de la cheminée pour rallumer mon feu je vis ce cadavre; il était bien là. Je sentais son odeur infecte, et j'avais beau me dire qu'il était impossible qu'il en fût ainsi; cette hallucination dure un quart d'heure." *

73. Fechner gives illustrations from his own experience, which were connected with general unhealthy excitability of the retina. His whole nervous system was in a state of unusual excitability, and the eye was so much affected that it afterwards passed into an intolerance of light, which lasted some years; but before this had declared itself, he found that when occupied with magnetic observations which caused him to attend to the sounds of the seconds struck during the passage of a black thread in the telescope across a white ground graduated with dark lines, he had only to close his eyes, or to be in the dark, to see before him the whole picture, which differed from the actual vision only in being somewhat less vivid, and being variable, disappearing and suddenly reappearing, as is usual with spectra. Moreover in the silence of the night he again heard the regular *tik-tak* of the second clock, and this with such vividness that he had to convince himself there was no second clock in the

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* ANDRAL: *Cours de pathologie interne*, III. p. 184.

next room. He also relates that one day after dinner he amused himself with watching teetotums spin round. The rest of the afternoon and evening, till eleven o'clock, was passed in arithmetical operations, deducing averages from many columns of printed numbers. On getting into bed his retinal field was suddenly filled with columns of numbers distinct enough for him to read off the numbers, though less vivid than in the actual vision. The effect was variable; sometimes the column disappeared in darkness, and a fresh column took its place. "Attention had nothing to do with this, for although the calculation did indeed go on in my head, the spectral column had no reference to it at all, but *wore the character of an event, not of a thought.* The most remarkable point however was this, that sometimes between the spectra of the columns there would intervene the spectra of spinning teetotums, although I had been earnestly engaged with the numbers, and had not once thought of the teetotums from the time of ceasing to play with them. These teetotums were of different sizes, and in like manner their spectra were different, now one and now the other appeared, spun round and sank. The phantasms lasted about an hour." *

Fechner remarks that although he has frequently a recurrence of the spectra of numbers, he has never spectra of printed letters such as he could read off as he reads the numbers; and the reason of this he justly assigns to the much greater attention necessarily given to the individual numbers than to letters.

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* FECHNER: *Centralblatt für Naturwissenschaften*, 1853, p. 778.

We pass rapidly over letters, but each number must be vividly impressed, especially when we are to draw averages, a process which involves not only steady attention but frequent recurrence; so after having looked carefully at it and gone back again more than once, the impression of a number is naturally deepened. "In earlier years," says Fechner, "when my eyes were strong and healthy, I never had such phantasms." *

74. Another example cited by him may be compared with Andral's case. A physician had to watch by a corpse, the aspect of which had very deeply affected him. Some days afterwards, while writing, he raised his eyes upwards, as one is apt to do in the pauses of composition, and suddenly there appeared before him the figure of that dead man, with the same expression of face which had rivetted him. It was as vivid as the reality, but with this difference: the figure was standing, and on its head was the hat which in reality had lain beside the figure. Here we see not only sensorial reproduction, but a slight degree of modification and recombination. This was therefore a true case of Hallucination at its lowest stage.

75. One point noticeable in all these cases is that the after-sensation gradually acquires an *increasing* energy, until finally it approximates to the energy of

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"Il y a peu de temps, j'éprouvais une vive irritation de la rétine; Je vis le soir, dans mon lit, au moment où je fermais les yeux, des caractères microscopiques que je lisais, lettre par lettre, avec une extrême fatigue; réveillé environ une heure après, ma mémoire était encore toute pleine de mon rêve, et je me rappelais alors avoir vu en songe un livre ouvert, imprimé en fort petit texte, et que je lisais péniblement —MAURY: *Le Sommeil et les Rêves*, p. 50.

actual sensation. The fact of increase is normal, but when it rises to the energy of sensation it is evidence of abnormal excitability. Some curious phenomena of Insanity find their explanation here. * Patients complain that their thoughts are uttered by some one else; that when they begin to write a letter the words are spoken after them; that when they think of a tune "some one" sings it. The thought-vibration has here swelled into the energy of sensation; but as the sensation wants the peculiar quality of the patient's own vocal sounds (not having the full muscular contractions of actual production), the sounds are attributed to "some one."

76. Connected with this subject of recurrent sensations and the recurrent images is the phenomenon which has of late years greatly attracted the attention of mental pathologists, and has been named by the Germans '*Zwang-vorstellungen*'— tyrannical ideas. It is the abrupt intrusion of some feeling or idea quite irrelevant to the feelings and ideas amid which it intrudes, and having so despotic an influence that it cannot by any effort of will be permanently excluded, and in some cases the action it prompts cannot be resisted. This is the germ of Fixed Ideas.

The physiological explanation I take to be this: Every complex group is composed of tremors having different velocities, and has a tendency to resolve itself into these elementary states by the unequal subsidence of these tremors. When the intermediate velocities have subsided they leave the more energetic tremors ready to recombine in a new group, either with each other or with some new tremors. Thus my image of a lion as it fades leaves the image of a quadruped, which fades into that of a living animal, and finally into that of a mere form, or a colour; and this form or this colour may combine with some other group, so that I pass insensibly from a lion to a mountain, to my friend's wedding and the present I shall make him. "Tyrannical ideas" are the intellectual forms of what in the organic sphere appears as periodicity in the attacks of epilepsy and insanity. There is some central disturbance which tends to recur; just as we see the child pausing in its cries to examine a new object, and no sooner is its new curiosity satisfied, than once more the grief recurs, and the tears again flow. A new wave of excitation passes over the troubled surface, but the groundswell continues when the new wave has spent itself.

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* SCHÜLE: *Geisteskrankheiten*, 85 seq.

77. These illustrations have led us far from our immediate topic of the persistence of vibrations, and have carried us somewhat into pathological and psychological questions of deep interest. We return enlightened to our starting-point, and recognise how important this property of the nervous system is, and how profoundly it demarcates organic from inorganic phenomena. Were it not for this persistence and recurrence of sensations no Experience would be possible. By it one sensible affection is blended with another. By it consciousness becomes possible. Transient impressions, even on our organs, are often indistinguishable, still oftener irrecoverable; if not sustained by the "after glow" of subsiding tremors, they are too fugitive for consciousness. The lingering effect of an impression enables a comp
be made with a new impression. E. H. W

experimentally that the comparison between two successive feelings became feebler as the interval was longer. In most persons it is very imperfect after 10 seconds. Weber himself could compare and distinguish between weights of $14\frac{1}{2}$ and 15 ounces after intervals of 15 to 30 seconds, but never after an interval of 40 seconds. He held a paper, on which a dark line was drawn, before the eyes of a man, and after a lapse of 70 seconds another paper with a line only $\frac{1}{11}$th longer than the former: the man distinguished these, but failed after a lapse of 80 seconds. These experiments, however, only apply to the niceties of measurement; qualitative differences have a much wider range.

CHAPTER VI.

DOUBLE PERCEPTION.

78. ANY one watching the process while he is singing, speaking, or writing, will observe that the note, or the word, rises into consciousness before it gains vocal or graphic expression, and recurs again after the expression. There is as it were an oscillation between cerebral impulse, muscular excitation, and recurrent impulse of a fainter energy, not followed by muscular *contraction*—only by muscular *twitter*. But in cases of unusual cerebral excitability the *recurrent* impulse has an exaggerated energy derived in part from the muscular reflex. It is difficult under excitement to restrict oneself to a single utterance. We do not say Come!—Quick!—Don't! but Come, Come!—Quick, Quick!—Don't, Don't! We repeat phrases, the repetition being even more emphatic. We do so, because the neural tremors are sustained and increased by the reflex of the muscular feeling following the muscular movement.

In abnormal conditions this is very strangely manifested. Insane patients not only hear voices and see objects where no persons, no objects are present, but they are often worried with the hallucination of a strange voice reading with them when they are reading, and dictating to them when they

A patient reading silently to himself hears the words whispered by a strange voice in his ear. He complains that his enemies not only pursue him with reproaches and hideous suggestions, but snatch his thoughts from him before he can utter them, and utter them aloud to him. He begins to write a letter, and before he can write a sentence it is whispered to him by his tormentors: they know what he is going to say, and say it before him, or they dictate it to him. Obviously the only difference between this and the normal process is in the intensity of the consciousness, transforming the image into a sensation and thus into an hallucination. To *think* a phrase, to utter it mentally, and the next moment to *hear* the phrase as an auditory sensation, is only another form of the process by which we think of an object, mentally see its image, and the next moment *see* it distinctly before us as a visual sensation. The vocal hallucination and the optical hallucination have the same course.

79. The writings of medical psychologists abound in examples of this 'double perception' as it has been called, and it has been explained by some writers on the hypothesis of a double action of the two hemispheres, one hemisphere repeating what goes on in the other.*

This explanation I cannot adopt, since it leaves wholly unexplained why the one hemisphere transforms the image of the other into a sensation; and also leaves unexplained why the normal action of the two hemispheres produces no such double perception. If we examine the examples more closely, we find that the patient who cannot read silently without hearing the words read aloud by a strange voice, ceases to hear that voice when he reads aloud. Huppert thinks that in this case the sound of the patient's own voice drowns that of the imaginary reader. But I should interpret the fact otherwise.

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* Compare WIGAN: *On the Duality of the Mind;* Sir HENRY HOLLAND: *Chapters on Mental Physiology;* JESSEN: *Versuch einer wissenschaftlichen Psychologie;* and HUPPERT in the *Archiv für Psychiatrie,* 1871, Bd. III., Heft I.

In silent reading there are images of sounds and images of articulations, but no sensation, no contraction, only a nascent sensation and a contractile twitter. The theatre is cerebral. In reading aloud the images pass from this cerebral stage down on to the sensory and motor stages, the nascent sensation becomes a full sensation, the contractile twitters become articulations. When therefore the patient reading silently hears another voice repeating the sounds, there is an hallucination of hearing, the image has become a sensation; and because this sensation is *unlike* that which is produced by his own articulations, the voice seems that of another person; necessarily so, since it has a different cause, and the feeling of vocal participation is absent. But no sooner is the feeling of vocal participation mingled with it, no sooner is the word uttered by him, and the articulate image no less than the sound image has passed from the nascent to the completed state of sensation, than the illusion disappears.

80. The only case I have noted in which the reading aloud did not completely banish the imaginary accompanying voice is very instructive. The patient was fearfully excitable and voluble, and in a torrent

of curses, cries, threats, and gestures expressed his belief in the existence of persecutors "who uttered his thoughts aloud as they rose in his mind, let him think what he would;" and when he tried to escape from their tormentings and to fix his attention on outward objects, they shouted the names of the objects at him; when he looked at a tree or a house, they cried, "That is a tree," "That is a house," or else, "He is looking at the tree," &c. This patient could only read very slowly because of his extreme shortsightedness, and he heard the voices repeating the words even when he read aloud.* The unusual cerebral excitement, in this case, suggests the reason. No sooner was the nervous discharge effected and the vocal muscles thrown into contraction, than the reflex from the muscles on the centre resuscitated the dying tremors. What we experience as a single and transitory state when in excitement we repeat a word—'Don't, Don't!'—this patient experienced as a continuous state, and the vocal excitation which followed the sonorous agitation again set going, though with fainter energy, the sonorous agitation. That is to say, the auditory centre being first set trembling by an impulse from the visual centre, disturbs the tension of the vocal muscles; these muscles, by their contraction, react upon the auditory centre through the same paths, and thus recal the sonorous sensations and the visual images. The words are reinstated along the whole line, though in varying degrees, and are *heard* again, and *thought* again, though not *spoken* again. In some cases—notably in the last stages of insanity—the same word or phrase is incessantly and irresistibly repeated. The babbling of imbecility, like the babbling of infancy, is due to the same cause.

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* HUPPERT: *Op. Cit.*, p. 87.

81. That the auditory hallucination is due, not to the double action of the hemispheres, but to the *downward* impulse of the cerebrum on the sensory ganglion and thence to the periphery with an energy greater than is normal may, I think, be seen in the example quoted by Huppert of a patient who when told to *think* of numbers *saw* them written on the window-frame, the table, or the face of a bystander, written in plain characters on a white ground; but according to the patient's own statement these numbers were not always 'shown to him as pictures' by his tormentor; sometimes they were 'whispered in his ear.' That is to say, the cerebral image of the numbers sometimes passed into the visual and sometimes into the auditory sensation; and unless all hallucinations are to be assigned to the double action of the hemispheres, these cannot be assigned to it.

to the cutaneous sensibility which enters as a component. There are indeed writers of authority who deny the existence of purely muscular feelings, assigning all thus classed to the cutaneous and articular surfaces. But since no one disputes that a variety of peculiar sensations arise from the activity of our muscles, and since moreover no one fails to discriminate between the feelings which accompany the passive state or excitation of an organ, and those which accompany its active state or operation, the motor element which is involved in both is so dominant in the latter as to constitute a class apart.

83. The question mooted by so many writers is not whether the various sensations arising from muscular activities shall be recognised as peculiar, but first, whether these shall be allowed to constitute a Muscular Sense; and secondly, whether this Muscular Sense has its seat, or organ, in the motor nerves and muscles, or in the skin and sensory nerves. The first is a matter of definition and convention. The second is a matter of fact. Those who deny the propriety of the term Systemic Sense may of course deny the propriety of the term Muscular Sense. But even they leave the physiological question open.

84. It is to this therefore we address ourselves. I hold that muscles and motor nerves are as necessary components of the mechanism of muscular sensations, as retina and optic nerves are of visual sensations; the contrary opinion, which is current among physiologists, seeming to me to rest on a misconception of the mechanism of sensation. The out-going nerve which innervates a muscle [illegible] and rightly called, Motor; the ingo [illegible] innervates

the centre is called Sensory. I need not here repeat the arguments by which I have shown that both nerves have the same property. It is enough to answer the commonly adduced fact that the motor nerve and muscle are insensible, by the fact that sensory nerve and skin are equally insensible. Only in the Sensorium are sensations produced; it is only as conditions of stimulation of the Sensorium that nerves, skin, and muscles operate in Sensation; and the fundamental fact of Physiology which I have for many years insisted on is that the outgoing nerves are quite as much integral parts of the sensitive mechanism as the ingoing nerves are. Our division into sensory and motor is purely analytical. The only doubt which is permissible is, whether the motor nerves by their activity can and do stimulate the Sensorium: which means, Can the sensorial state be affected by the neuromuscular action? Before answering this doubt, it may be well to note that, owing to the complexity of the phenomena and the wide range of Motor feeling, many states are usually included under the rubric of the Muscular Sense which have little or nothing of what is known as muscular *contraction.* There is, for example, the central activity co-ordinating motor impulses. There is again the central activity of ideal movements, that is of movements imagined in thought but not carried into effect through actual contractions; though here, perhaps, there is always a faint motor discharge on the muscles which is followed by contractile twitters. There are, further, motor intuitions; formed, as all intuitions are formed, out of the residua of motor experiences. It is by these latter that we estimate the degree of force and the co-ordination necessary to innervate the muscles for a particular act; and as this estimate precedes the contraction it cannot be referred directly to the muscles; so that some writers have concluded that the so-called Muscular Sense is nothing else than this Sense of Force (*Kraftsinn*).

85. Two hypotheses are advanced in explanation of the muscular feelings. The one assigns them to impressions made on the sensory nerves of the skin and surfaces by the contractions of the muscles. The other assigns them to the central disturbance accompanying the discharge on the motor nerves. Since both hypotheses are maintained by eminent investigators, it is presumable that the true explanation must at least include the facts of both. I think both are to be included, and a third class added.

The muscles are innervated from the central system which, receiving its stimulation from ingoing nerves agitated at the periphery, discharges on the outgoing nerves, and thus excites the muscular contractions. The muscles have envelopes and attachments. The skin which covers all is richly supplied with nerves. When a muscle contracts, the envelope, attachments, and skin are thereby stretched, pressed, folded, and their nerves are agitated; as these are ingoing nerves, they propagate their agitation to the centre, and stimulate it: a sensation is the result. Now the muscular feeling was not the stimulation due to the first peripheral stimulus—say the prick of a pin—which initiated the motor discharge; that was a sensation of pain, very unlike a muscular sensation; it was not due solely to the motor impulse itself, because had the limb been paralysed the dis charge would have taken place, but no movement would have been effected, consequently no specifically *muscular* sensation felt. We seem to arrive then, by exclusion, at the alternative either, first, that the muscular sensation arises from the direct stimulation of the motor nerves agitated at their periphery by the contraction, and sending a wave of impulse back upon the centre; or, secondly, that it arises from the direct stimulation of the sensory nerves agitated at their periphery by the pressure of the muscles stretching and folding the skin and envelopes. According to current notions the first is inadmissible, because motor nerves are insensible, and are said to be incompetent to excite the centre (!) whereas the cutaneous nerves have this special office.

86. The defect of this view seems to me to consist in isolating one stage of a complex process—disconnecting the passive and the active pole—and too readily assuming that on the passive side the ingoing nerves only are competent to excite the centre, so that motor nerve and muscle are excluded from the mechanism of sensation. In a paper read at the British Association 1859, I thought I had experimentally proved that muscular sensations could not be, as Schiff said, due to stretchings and foldings of the skin; but I now see that the proof was defective, for although it showed that in complete anæsthesia of the skin, nay even when the skin had been stripped off, and when no pricking, pinching, or burning of the muscles produced the faintest sign of sensibility, there was still muscular co-ordination and muscular activity unaffected: this only proves that motor intuition once established may suffice for ordinary

co-ordinations; it does not prove that muscular sensations accompanied these muscular contractions. Indeed, since I admit that cutaneous sensibility is a component of muscular sensation, its absence in these experiments must have materially altered the normal mechanism of the sensations. Is there any ground for supposing that its absence was not the total withdrawal of the requisite conditions? In other words, in the absence of the excitation of ingoing nerves were there any channels of excitation open?

87. My belief is that the outgoing nerves would necessarily be agitated by the muscular contraction they had induced. The grounds of this belief are various; I will only mention three. Experiment has proved that all nerves transmit excitation in both directions—upwards and downwards. When the nerve acts upon and stimulates the muscle, it is a consequence that the muscle should react upon and stimulate the nerve (a consequence which is strengthened by the fact of a considerable homogeneity of structure in axis cylinder and contractile substance). The motor nerve thus stimulated by the muscle sends a recurrent wave of impulse to the centre. In this respect the motor and sensory nerves are alike. Neither can be in action without disturbing the balance of the centre to which they belong, and the change of state thus induced is either a sensation or a sensible component. To these general considerations add the clinical evidence. A paralysed limb may be stimulated by a motor discharge, but the muscles do not contract, or *if* they contract they are not so co-ordinated and subordinated

as to permit the motion of the limb. There being no movement effected, there is no normal muscular sensation. But although the sensibility of the skin and articular surfaces is out of operation, *some* sensibility must be in operation, for the patient very distinctly feels an unaccustomed sensation of weight, resistance. This feeling is plausibly referred to the central discharge or effort: the motor impulse is resisted, and this resistance is felt. Very true: but how does the feeling arise? How does this very failure to move the muscles exaggerate the central discharge, increasing the effort? Whence this increase of stimulation? Not from the sensory nerves of the skin; *they* are unaffected; only the motor nerves therefore remain; and these must be affected by the *abrupt change* in their state which the resisting muscle effects. A wave of impulse has passed along the nerve, and this, which in normal cases would flow into the muscular current, has been abruptly stopped—like the wave which flows into another wave in the advancing tide, and is dashed into foam when it meets the rocks. The agitation of the nerve, which is the consequence of this disturbance, acts by a recurrent impulse on the centre.

Observe, I am very far from underrating the operation of cutaneous sensibility in muscular sensation: I only insist on its not being the sole agency. Clinical facts show that human patients in states of such cutaneous insensibility that they felt neither prickings nor burnings, neither pressure nor electrical currents, nevertheless felt any movements their limbs might execute, any movements they might be forced to execute, and the resistance which might obstruct such movements. (DUCHENNE: *De l'Électrilisation localisée*, 1861, p. 425.)

88. It is thus evident that whatever place may be assigned to the cutaneous sensibilities, the operation of some other factor is necessary. Let us now therefore, having disproved the hypothesis which assigns muscular sensations to the so-called passive sensibilities due to ingoing stimulation from the surfaces, pass to the hypothesis which assigns them to the active sensibility of the outgoing discharge. This hypothesis takes two forms, a physiological and a metaphysical. Dr. Clifford Allbutt briefly expresses the first in these terms: by muscular sense he means "the consciousness of the varying states of Neurility in the motor nerves, and of tension in the central cells connected with them." (*British Med. Journal*, Feb. 20th, 1869.) Professor Bain expresses it thus: "The sensibility accompanying muscular movement coincides with the *outgoing* stream of nervous energy, and does not, as in the case of pure sensation, result from any influence passing inwards by incarrying or sensitive nerves." The sensitive nerves are, he thinks, "the means by which the *organic* states of the muscle affect the mind. It does not follow that the *characteristic feeling of exerted force* should arise by an inward transmission through sensitive filaments; on the contrary, we are bound to presume that this is the concomitant of the outgoing current by which the muscles are stimulated to act." (*The Senses and the Intellect*, p. 77.) To the same effect Ludwig and Wundt, the latter establishing a distinction between innervation-feelings and muscle-feelings. (*Physiologische Psychologie*, p. 316.)

89. The metaphysical form of the hypothesis is that we are endowed with a "native power" of estimating the force necessary for each movement; just as we are by some philosophers believed to be born with an intuition of Space and a "sense of distance." In this view, Force is the direct revelation of Consciousness, which, when projected into the external world, appears as Cause. Independent of and antecedent to all experience, we know the degree of Force, or Effort, which a movement demands: this is a birthright of the Soul.

A combination of the metaphysical and physiological view may be found in Johannes Müller, who was too good a physiologist to adopt the purely metaphysical view, and too much of a metaphysician to adopt the physiological view thoroughly. "It is not certain," he says, "that the idea of the force employed in a muscular contraction depends solely on a sensation. We have a very exact notion of the quantity of nerve-force starting from the brain which is necessary to produce a certain movement." This is true, or false, according to the point of view: it is true if the notion is a *motor intuition framed out of registered experiences*—just as we have an exact idea of a circle before we draw it; an exact idea of the pain which will follow a prick, before the pin touches the skin; an exact idea of the distance of an object before we stretch our hands to seize it. But these illustrations show the error of the view which, placing the cart before the horse, supposes the notion to have been in existence *before* movements which it ideally reproduces had originally produced it. And the error becomes conspicuous in the light of clinical evidence that when there is anæsthesia the patient is utterly incapable of regulating the force. Not only does he cease to hold an object on ceasing to look at his hand, but he is so unable to regulate his muscular energy that he crushes a brittle object when he grasps it, as an infant crushes a butterfly; and if he grasps your hand, it is spasmodically — he cannot lessen the pressure at your request. The estimate of force is independent of the muscular sensation only as the idea of a circle is independent of the power of drawing it. I may have a mental vision of a human face, but my attempt to draw on paper what I thus see will be successful only in proportion to the education of my muscles. The registered experiences of former efforts have furnished me with motor intuitions; but the carrying of these into effect depends upon the motor feelings being normal—the numbness of cold, or the pain of rheumatism, will disturb the mechanism.

90. It seems clear that the two hypotheses of passive and active stimulations, derived through the ingoing and outgoing nerves, having both an array of evidence showing that a feeling of movement involves sensibilities of the two kinds, leave us no alternative but to include both, and not assign the feeling to either separately. The evidence proves that muscular adjustments and motor feelings may exist when there is anæsthesia of the passive sensibilities: therefore these latter cannot be the sole sources of the coordination and muscular feeling. But the evidence also shows that the passive sensibilities normally enter into the complex feeling, and any diminution of them is a disturbance of the co-ordination, and

a variation in the quality of the feeling; the disturbance of co-ordination may be nullified to some extent by the co-operation of some other passive sensibility, notably that of sight, but nothing will nullify the variation in quality. Let us glance at the evidence.

91. A patient whose cutaneous sensibility is lost can supply its place. He walks steadily so long as he can "lean upon his eyes as upon crutches;" he can reach an object if he looks towards it; he can hold one so long as his attention is directed towards it. Close his eyes, and he staggers, moving his arms wildly; call off his attention, and the object falls from his hand. Some patients cannot even stand when their eyes are closed. Have they then lost their muscular sensibility? This has been rashly concluded. It is disproved by the co-ordination: this certainly is not *effected*, it is only *aided*, by sight. The loss of the accustomed sensations derived from the skin has disturbed the accustomed *quality* of the complex feeling, and, although the sense of Effort remains, the sense of Effect is absent. The patient does not feel the usual consequences of a movement, and therefore does not know whether it has taken place or not, unless his sight informs him; and, since the Sensorium requires that it should be informed at each step whether the movement has been effected before it innervates the successor, a bewilderment ensues; which may be faintly appreciated by anyone studying his feelings when moving in unfamiliar places in the dark, or even when closing his eyes and trying to reach an object on the table. The movements so accurately and unhesi-

tatingly co-ordinated with the aid of sight, now become tentative and inappropriate. A similar case is that of the deaf man becoming dumb: no longer hearing perfectly the sounds he utters, no longer rightly informed of the effect, he first loses his power of rightly adjusting the efforts—speaking now in tones scarcely audible, and now in shouts—and, as the deafness increases, he finally loses the power of speech. It should be added that only such movements as we are accustomed to direct by sight are capable of being thus directed when there is cutaneous anæsthesia. We, who were not born blind, learn to direct our feet in dancing, and our hands in manipulations of complex kinds, by looking at them. Movements of the eyes, tongue, glottis, &c., are not thus aided. They are learned through the muscular feelings—as the pianoforte-playing of the blind is learned. But any considerable disturbance of the usual elements of a process must cause a disturbance of co-ordination. Heydt has shown, by experiment, how great a disturbance accompanies anæsthesia of the soles of the feet (*Der Tastsinn der Fuss-sohle*, 1862), but even this may be compensated by attentively watching the steps.

92. After giving due weight to the evidence which shows the dependence of feelings of movement on the normal influence of cutaneous sensibility—evidence we have already intimated as merely disclosing one factor—let us now consider the other side. There are cases on record of marked defect of co-ordination where *no* appreciable defect in cutaneous sensibility existed. The cases, indeed, are rare;* I had

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* VULPIAN says: "On a cité quelques cas très-rares dans lesquels la

the good fortune to study one under Prof. Friedreich at Heidelberg. The patient was a girl, about twenty, healthy in all her organic functions, and with well-nourished, powerful muscles. The sensibilities of her skin were perfectly normal, responding to every stimulus in the normal way. Her localisation of impressions was normal. She could bend or stretch arms, fingers, legs, and toes at will; and the power over her muscles was such that I could not with my utmost force bend or straighten a limb if she resisted me. But her co-ordination was so imperfect that she could not walk unless leaning on some one, and even then threw out her legs in a spasmodic and disorderly manner. Nor were her upper limbs more under control. If she attempted to reach an object, or to clutch one presented to her, the movements were singularly incoherent, and never succeeded until after many corrections of the effort. It took her several minutes to button her dress, though finally she always succeeded. In short, there was a great disturbance in the ordinary regulation of movements of the limbs—(those of respiration, facial expression, speech, &c., were normal)—although her skin was unaffected. I remarked to Prof. Friedreich that I had seen a frog with the sensory nerves of one limb wholly destroyed, and another with no skin at all, yet the movements in both cases were far more co-ordinated than those of this girl.

This curious example raises many questions which I cannot touch on here. It is an example of abnor-

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sensibilité était restée intacte bien que les phénomènes d'ataxie locomotive fussent très-prononcées. Je n'ai jamais vu de cas de ce genre."—*Archives de Physiologie*, 1868, p. 148. In TROUSSEAU'S *Lectures on Clinical Medicine*, translated by BAZIRE, p. 209, two good examples are given.

mal irradiation, and consequent failure of co-ordination, rather than of any absence of purely muscular feeling. The girl had muscular movements and muscular sensations, but failed to combine the movements with normal precision; the volition was normal, but there was a defect somewhere in its execution.

93. Nothnagel* reports a case of a man who after a bad attack of typhus fever was almost incapable of bending his arm, and only succeeded after immense efforts extending over at least fifteen seconds, and accompanied by turgidity of the facial muscles only seen in men who lift a heavy weight. No sooner was the arm bent than it was let drop, with a feeling of great fatigue; nor could the flexion be repeated more than once. On examination Nothnagel found that the cause of this strange incapacity was that the *antagonist* muscles were set in action at the same time, and it was against their energy that the man struggled when he tried to bend his arm. Thus instead of innervating the flexors only, the nervous stimulus passed at once to both flexors and extensors. The same thing was noticed when the patient having his arm quietly bent wanted to straighten it: the flexors were then stimulated in conjunction with the extensors. But—and this is a noticeable point—if he gave a sudden jerk, the arm was easily straightened or bent; and a similar result followed the direct stimulus of the biceps muscle from a powerful battery.

Nothnagel assigns the cause to an irradiation of the central volitional impulse. There is doubtless irra-

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**Archiv für Psychiatrie*, 1870, p. 217.

diation of the central impulse, since clearly the centres of both flexor and extensor muscles have been excited; but why the normal independence of these centres should be thus abnormally abolished he does not suggest. He stands, indeed, for a moment at the threshold of an explanation; but quits it immediately because he does not see whither it leads. He suggests that this irradiation may be due to a reflex from the contracted muscles through their sensory nerves; but as he follows the established hypothesis of muscular sensibility being due to the *sensory* nerves, and the reflex must in this case be effected through the agency of these nerves, he has no difficulty in refuting his own suggestion by experiments showing that irritation of the sensory nerves does not suffice.

94. According to the view I hold of muscular sensibility being partly due to the excitation of the centre through the motor nerve—(the very nerve which carried the central impulse to the muscle carrying backwards a vibration to the centre)—there is no obscurity in this case beyond that of most abnormal cases. The contraction of a muscle is effected by a succession of nervous shocks, each of which is in turn reversed on the centre; with the reversal of the first shock there is an increase in the agitation of the centre so that the second shock has increased energy, this again is reflected on the centre and increases its agitation, and so on; *thus the stimulus which at first would only produce a contractile twitter has grown into a force capable of producing a contraction.* But all this while there has been a corresponding increase in the tendency to irradiation from one group of nerve cells to another;

and while the flexor muscles have been twittering and passing into contraction, the extensor muscles have been undergoing a similar excitation; but as the stimulus to flexion precedes that of extension, the arm is finally bent; the flexion triumphs when it is the first to be excited, extension when it in turn is the first.

This is the cause of that alternation of flexion and extension, and generally of the many alternations of action visible in the normal organism; one set of muscles having been set going, another and antagonistic set immediately succeeds. The rhythm of motion determines not only inspiration and expiration as inevitable couples, but the movement of one leg tends to succeed that of the other. In the normal state these alternations pursue an uniform course, the one never begins till the other ends. But in abnormal states we see a struggle—'catching of the breath'—which is due to the antagonist muscles beginning to enter into action prematurely.

95. In sneezing, coughing, and stuttering we have examples of action arrested by this irradiation of central impulse. The peripheral stimulus excites too many antagonistic muscles; and it is not until the growing intensity of the sensation in one direction determines a preponderance that the discharge—the sneeze—takes place.

Is not aphasia due to this irradiation? At first—in infancy—all impulses are irradiated so that general agitation of the body succeeds every stimulus. Only the organised mechanism acts definitely and independently. We learn to limit the pathways of impulse. Children shout, clap their hands and dance, where the grown man smiles. Gesticulation and awkward automatic actions called tricks are most conspicuously present in persons of high nervous excitability. No man can raise a heavy weight without at the same time contracting the muscles of his face. And in making any difficult or delicate adjustment we all aid ourselves by licking our lips, widening the corners of our mouths, or other grimace of mysterious usefulness. Jaccoud speaks of an old general who had lost a forearm: whenever he coughed, the stump was raised by a contraction of the deltoid; the other arm remaining quiet. Brown Séquard and Tholosan found that if one hand be plunged in very cold water, the vessels of the other hand contract (*Mémoires de la Société de Biologie*, 1851).

Liégeois has shown that the iris may be made to contract even when the whole encephalon has been removed, by exciting the superior ganglion of the great sympathetic.

CHAPTER VIII.

MOTOR PERCEPTIONS AND INTUITIONS.

95a. The sensations arising from muscular contractions (in which are included the vasomotor effects) are, like other sensations, gradually combined and condensed in perceptions and intuitions.

A movement is effected in response to a stimulus. It is felt, and, after a time, *localised.* The whole group of feelings prompting, accompanying, and following the movement, is registered and associated with the visible effect: we have then a motor perception, *i.e.*, we infer that a given sensation will be followed by a given movement, or that a given movement will be accompanied by and followed by given sensations. It has taken its place in the ideal sphere: we know in an intuition that by moving the arm we shall reach an object, by turning the head we shall see what is now invisible, by moving the vocal organs we shall sing or speak; just as we know that the coloured object on the table is an orange, and that if touched it will be cold and rough, if smelt and tasted it will be agreeably odorous and sapid. Motor perceptions are condensed in intuitions and generalised in conceptions.

The formation of words is a good example of motor perception. Originally the word is an articulate sound, expressing a feeling as the movement of a limb expresses a feeling: the sound and the articulation are the analytically separable passive and active sides of the process. After many repetitions the expression is *registered* in the ideal sphere. It is then ideally recoverable, is mentally heard, without actual production. It has become a symbol or part of our mental possessions, to be employed at will, under infinitely varying combinations.

96. The motor perceptions, which are frequently called into play, become organised intuitions, which operate subconsciously and unconsciously, and only need their accustomed stimulation to initiate a long and complex train of actions. The starting of a single bar of melody will thus call up both words and melody; the sight of the musical notes will set going all the complex movements of the pianist, whose thoughts and conversation may be directed to quite other subjects. Intuition is to sensible affections what Co-ordination is to muscular contractions, and Logic to images and ideas: namely, the residual product of a grouping process, which in turn becomes the regulator of subsequent processes. It is an element in the *acquired* mechanism named Experience, and differs from the corresponding element in the *connate* mechanism, the inherited anatomical disposition of structure, only in the variability of its stimulation, not at all in its mode of operation. An intuition operates with the same certainty as a connate reflex: for it has become a wheel in the sensitive machinery.

97. In a movement we may recognise five component processes: 1, the stimulation (sensible or ideal); 2, the discharge on the motor nerves; 3, the

contractability of the muscles; 4, the association of different muscles, flexors, and extensors; and 5, the muscular sensibility. A defect or excess may exist in any one of these, with a corresponding want of energy or precision in the movement. The muscular contractability may be exhausted; that of a flexor or extensor may be exaggerated; there may be anæsthesia, superficial or deep-seated; there may be such a state of the centre that the co-ordination is not effected, or the contraction is unfelt.

The combination of all these processes is Co-ordination, which may be native or acquired, simple or complex. An infant yawns in response to some visceral stimulation. A man will also yawn from a similar cause; but the man will equally yawn in consequence of a cerebral stimulation, when he sees another yawning or hears the action spoken of. The infant babbles in virtue of its connate mechanism, the mere delight in the exercise of his vocal muscles and in the sounds will sustain the discharge; but in after life the same vocal muscles will be set going by images and ideas which excite the motor intuitions of verbal symbols not acquired by the infant.

98. The actions which have become automatic through repetition, are guided by motor perceptions and intuitions. The organs then may be likened to the strings of a piano, each of which vibrates when its key is struck. The motor nerves are the keys. The Sensorium is the player—who may be conscious or only subconscious of what he does. The player learns which keys are to be struck in succession and combination, and he learns this by registering the effect of each stroke, associating particular [illegible]s with par-

ticular movements. When these associations have grown into motor intuitions, the muscles obey with such precision that the player needs nothing but the auditory or muscular sensations to sustain his performance; his eyes, vocal muscles, and thoughts may be otherwise directed. A man who has registered observations has an intuition of the effect of exploding gunpowder before the spark comes in contact with the gunpowder, an intuition of the spherical form of an apple when he only sees a part of its surface; so he has an intuition of the movements necessary to achieve his purpose after experience of such movements has registered these associations. The amount of innervation required to raise a given object, say a leathern portmanteau, becomes intuited by registration of sensations of pressure and strain, combined with sensations of sight. We estimate the amount of force, because we remember the amount we have before exerted. If we know, or infer, that the portmanteau is empty, or filled with clothes, or with books, we regulate the amount of innervation by this knowledge.

99. It is of such motor perceptions and intuitions that Volition is mainly constituted. The Will sees the end, not the means. It *knows* nothing of the mechanism employed, but *feels* how to employ it, and corrects each error by a vision of the end. The violinist cannot tell what muscles he has to innervate, because he *cannot resolve his intuitions into their sensible components*. Yet, in fact, an intuition precedes every one of his movements, and each note is mentally heard before it is mechanically executed. Any one attentively observing will detect this "cerebral

rehearsal" when he is singing, speaking, or writing. And not only is the note or word rehearsed, it is subsequently appreciated, and if not felt to be congruous with the intuition, the note or word is corrected.

100. Thus it is that we can only be said to *will* what we are able to *do*. We may indeed desire to do something we cannot do, or to have what is unattainable, but desire is not will. No energy of desire will enable us to draw a face or play on an instrument, until trials have registered the needful perceptions. Once registered, these enter into the ideal sphere, and acquire a certain independence of the mechanical conditions out of which they arose. We can then not only rehearse actions which we do not perform, but combine these intuitions and perceptions into new groups, actions which we cannot perform. Much of our education is "cerebral rehearsal" of this kind, preparing modes of innervation which will cause muscles to combine in new groups, or with greater precision. De Morgan knew a guitar-player who rarely practised on his instrument, nay, did not even possess one: all his "fingering" was cerebrally rehearsed. He thus established the neural groups, which when discharged on the muscles would cause corresponding movements.

Besides motor perceptions there are motor conceptions. From the perceptions we abstract such general conceptions as Action, Design, Plan, Cause, &c., and we do this so inevitably and insensibly that, like our intuitions of Space and Time, they have been said to be innate. I must not, however, enter on so wide-reaching a topic, but will pass at once to

MOTOR HALLUCINATIONS.

101. The motor sensations are reproduced as motor images, and organised as motor intuitions. They are usually blended with other feelings, notably with those of sight, but they have a distinctive character of their own. The motor images, like those of other sensations, are capable of entering into combinations impossible to the corresponding movements; like other images, also, they at times acquire the intensity of sensations, and thus produce motor hallucinations. A familiar example is the fact that, after holding a heavy weight with both hands, we seem, on letting go our grasp, to rise upwards, the arms retreating as it were into the breast. Another example is, that after a long sea voyage the earth seems to rise and sink beneath us with the swell of a sea. Insane patients often speak of the elongation of their limbs, the expansion or shrivelling of their bodies.

102. Such hallucinations would suffice, were there no other grounds, to show that the motor feelings are due to states of the centre, and not to states of the muscles or sensory nerves; because *they arise even after the limbs have been amputated*, when, of course, the muscular actions represented in these motor images are absent. An optic nerve and apparatus is necessary for the production of a visual sensation and its image; but when once produced, when once the Sensorium has been so affected, this image may be reproduced and acquire the intensity of a sensation, in the absence of the optical stimulation, nay after the optical apparatus has been destroyed. The same is true of muscular sensations. Dr. Weir Mitchell says:—

"Nearly every man who loses a limb carries about with him a constant or inconstant phantom of the missing member, a sensory ghost of that much of himself, faintly felt at times, but ready to be called up to his perception by a touch or a change of wind." In 90 cases under his care he only observed 4 which were without this illusion. "Very many have a constant sense of the limb. 'If,' says one, 'I should say I am more sure of the leg which ain't than the one which air, I guess I should be about correct.' The sufferer gets up in the night to walk with or to scratch his absent leg. One of my cases attempted when riding to pick up his bridle with the lost hand while he struck the horse with the other. Another tried at every meal, for nearly a year, to pick up his fork, and was so disturbed emotionally at the result as frequently to be nauseated or even to vomit. . . . *The limb is rarely felt as a whole;* nearly always the foot or hand is the part most distinctly recognised, especially the fingers and toes; next to these the thumbs; then, more rarely, the ankle or wrist, and still less frequently the elbow and knee. On the other hand, there is in but few cases any consciousness of the parts intervening between the stump and the extremity. In many cases the hand seems to be at rest, extended, the fingers in a like position. Others carry with them a hand in a more or less violent flexion, and possess but slight (imaginary) control over it. A small number have entire and painless freedom of motion as regards all parts of the hand.

"'My hand is now open, or shut,' they say; 'I touch the thumb with the little finger; the hand is now in the writing posit[illegible]ween these cases and such as are conscious of an immobile member, every grade of difference as to motion is to be found, with equal varieties as to the associated pains. In cases where the arm has been amputated at the shoulder, the muscles which act on the fingers have of course been entirely removed, yet in these cases there is fully as clear and definite a consciousness of the movement of the fingers and their change of position as in the others. In other words, the volition to move certain parts is accompanied by a mental condition which represents to the consciousness the amount of motion, its force, and ideas of the change of place in the parts so willed to move."[*]

Motor intuitions enter as components into that general picture of the organism and its activities which we carry about with us, and regard as our body in contradistinction to our mind. The "phantom limb," of which Weir Mitchell speaks, is only one detail in the general picture mentally formed of the body; as the body in turn is only one detail in the general landscape—the objective world—which is the theatre of our actions.[†]

All shades of muscle tone are represented in consciousness. They may be classed as feelings of *strain* and *release*—of arrest and movement. Every stimulus which fixes attention is felt as a resistance, irritating until a reflex comes to release it and change the feeling into one of satisfaction; the effect is measured by the effort; both are registered and reproduced in ideal states, so that we can adjust the effort to the wished-for effect. But there are illusions and hallucinations of the muscular sense—arising either from the cerebral or muscular states. Patients feel their bodies expanding and lengthening or shortening into that of a child; others, as in general paralysis, feel exaggerated powers of muscular acts. Some feel part of their bodies turned inside out, snakes in the abdomen, ants creeping over them, &c. Some imagine themselves brittle as glass; others imagine themselves dead. Præcordial anxiety is perhaps due to alteration of the muscle tone in the heart and respiratory organs (Griesinger, M.M., 105). It is noticeable that such hallucinations are accompanied by anæmia and defective secretion. There are no tears in the wildest grief of insanity; all the other secretions are diminished.

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[*] Weir Mitchell: *Injuries of Nerves*, 1872, pp. 348–59.

[†] Brown Séquard's Journal, *D'une Hallucination du Toucher*, iv. 428.

103. The whole subject of Motor Feeling is too large to be exhaustively treated except in a monograph. When we reflect that muscles and blood-vessels enter into the composition of every organ, we see at once how omnipresent the motor element must be. Not only the muscular activities, but the vasomotor effects have to be taken into account. A very moderate excitation of a Sense appreciably affects, not only the Sensorium through the Sense, but also the pulse, the secretions, the respiration, and the contractions of the Iris—and through these the Sensorium is in turn affected. That effect which is conspicuous in emotion arresting or accelerating the movements of the heart, lungs, and limbs, is only an exaggeration of what occurs under every excitation. It is true that the majority of motor feelings are unconscious feelings, though all are capable of emerging into consciousness. The muscular sensibility is tolerably unifor[illegible]y,

varying mainly in degree; whereas the sensibilities of the senses are various in quality as in degree.

104. Note especially this fact: all the phenomena recognisable in the sensory sphere are recognisable in the motor sphere. What is true of the passive side of Sentience is true of the active side. If we find over and above the intermingling currents of particular feelings a general and persistent stream of Consciousness, which forms a central Personality, we find in like manner, over and above the various muscular sensibilities, a general and persistent muscular energy, according to which our body feels light or heavy, vigorous or weakly; and this general sensibility has also its "centre of gravity," by which our movements are incessantly regulated. Again, we find both in the motor and sensory spheres the gradations of conscious, subconscious, and unconscious. In both there are sympathies, habits, disorderly combinations, and hallucinations. Each sensation rouses its escort of nascent sensations, each movement its escort of nascent contractions; each sensation thus gets associated with others, each movement is accompanied by others.

105. A volume might be profitably devoted to an enumeration of all the modes of influence which arise in the operation of this Motor-element. Psychologists, especially of late years, have been agreed in referring to it at least one important influence in the formation of the conception of Self and its correlate Not-self. The motor feelings constitute the very core of Self. All those feelings in which the motor-element is obscure are said to be passive, to be excited in us by stimuli external or internal, which are outside the

Ego. It is we who *react;* and in reaction the motor-element emerges. We feel pain, colour, sound, &c., but it is we who create by movement the relief of pain, we who direct our senses to the objects and will our actions. Physiologists have exemplified its influence in the operations of the various senses. Pathologists have been necessarily led to lay great emphasis on the alterations of the motor functions in connection with alterations of the sentient functions, so that few reflecting observers will feel any hesitation in admitting the intimate and frequent connection of sensation and motion, even if they hesitate to admit the view I hold respecting the necessity of such connection. Very noticeable it is that mental pathologists have recently been led by their observations to bestow even more attention on motor anomalies than on the less conspicuous sentient anomalies which are usually supposed to characterise mental disease. They have rarely, indeed, appreciated the full significance of such observations, owing to the traditional bias which separates Mind from Body, and thus regards mental maladies as something distinct from bodily derangements.

106. It is justly remarked by Falret * that the movements of the insane require close attention as symptomatic of the cerebral lesions, and as a basis of therapeutic indication. Writers on this subject do indeed usually include the movements in their descriptions, but not with sufficient precision. The disturbance of the muscular system has been studied chiefly in respect of paralysis and aphasia; but it is also revealed in the intonations of the voice, in

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* FALRET: *Leçons Cliniques de Médecine M* [illegible] p. 191.

laughter, sneezing, eructation, &c. The muscular movements are but the translation of the internal disturbance. Beside the rapid change of colour, one may observe convulsive movements of the cheeks, the lips, the nostrils, the eyebrows and eyelids, and sometimes odd contortions of all the features. There are not only the well-known movements of the eye—troubled, wandering, fixed, or frightened—there are strange movements upwards and inwards of the globe, and sometimes squinting. In these states the muscles are mad. The system of *expression* is as much beyond the normal control as the system of *conception*.

Mental pathologists have long ceased to regard Insanity as a malady affecting the Intellect only, and have been taught to seek for its primary seat in the Feelings. This has led to, and has been sustained by, the more careful consideration of the organic conditions; and when once the attention settled on the physiological mechanism, it was inevitable that the motor anomalies should assume immense importance. Now, since mental maladies are only abnormal states of the organism, it is in them that we may see the normal laws made conspicuous by exaggeration of excess or defect, under these "experiments instituted by nature;" and the psychologists will learn as much from the careful study of the insane, as the physiologist learns from the careful study of disease.

107. I cannot here adduce a fiftieth part of the evidence which mental pathology affords of the Triple Process. I can only point out that field of research to the student. Enough for my present purpose to

have shown that the long-suspected identity of Sensation and Thought, as regards the fundamental process, having been of late years placed on a well-reasoned basis, the physiological integrity of Sensation and Motion, also recognised, completes the data for the hypothesis of the Triple Process.

CHAPTER IX.

DIFFERENCES IN THE TRIPLE PROCESS.

108. It has been the constant aim of our analysis to show the essential identity of all psychical phenomena, whatever may be their diversities—how Feeling and Thought are indissolubly interwoven, and how Motion enters as a necessary element into both.

After displaying the co-operation of the three elements in Sensation, it will be needless to display it in Imagination, images having been proved to be reproductions of their sensations; nor can the separation of the sensorial and cerebral fields, as the special centres for Sensation and Imagination, affect this identity. But although the reader may feel little hesitation in concluding that whatever was proved of the sentient process in Sensation must be true of the sentient process in Imagination, he may be too much under the influence of traditional views to extend this principle to Ideation, especially if he insists on the essential distinction between Thought and Sensation; nay, even if he adopts the distinction I have insisted on between images and ideas. Our task therefore is not completed until we have shown that neither of these considerations disturbs the conclusion. That Thought is the same phenomenon as Sensation I deny not less emphatically than he can. But I hope have made evident that Ideation and Sensation are both special forms of Feeling, and since Ideation usually stands for Thought (when Thought means anything but Operation in general), we may say that Thought and Sensation are two special processes of the general process Feeling, precisely as arithmetic and algebra are two special processes of the general process of Calculation. The point I have endeavoured to establish is, that whatever important differences may be noted between the use of particular signs and general symbols, they are both explicable on the theory of Signs, both regulated by the same Laws in so far as they have community of conditions.

109. But are not ideas wholly unlike images? If they have another origin and another anatomical seat, why may they not involve another and unlike neurological process? What is the *motor* element, for example, in the idea of Infinity, the idea of Virtue, or the idea of the evolution of organisms? It is questions like these that our theory of the Triple Process will raise in many minds.

We need not insist on the instinctive use of such phrases as mental *feelings*, mental *joys* and *sorrows*, mental *efforts*, &c., because although such instinctive judgments have often a rational justification, they are often illusory, and Philosophy has to be on her guard against them. We have surer ground to stand on. Even those who continue to accept the spiritualist hypothesis of a Mind acting on and through the Organism, as a musician plays on an instrument, must still admit that the laws of the instrument played on are manifested in the music played. If there is a spirit hovering over [illegible] ls and willing the movement of the limbs, yet the movement itself, being a movement of limbs and not of spirit, is regulated by mechanical and anatomical conditions. Hence it is clear that since Ideation is effected through the agency of the Nervous Organism, every idea must be conditioned by neural laws. Every idea is thus a manifestation of Feeling: a sentient operation. We have seen that the sentient operation always involves the Triple Process; and hence the idea must involve it.*

110. But not only is it deducible from the general position of Ideation as a special form of Feeling; it is deducible from the position we have established that ideas are unspoken words. Thought specialised in Ideation becomes materialised in Language. In pursuing the most abstract speculations we are really articulating and sounding the words which are the embodiment, or symbol, of the ideas. I remember Leigh Hunt once remarking that he had a great disinclination to read works in French, because, although he knew the meanings of the words, he was aware that his pronunciation was imperfect; and as it is impossible to read without a suppressed articulation, the sense of imperfection haunted him. Now if from our cerebral condition this normal process of silent articulation be exaggerated, we think aloud; and this may be carried so far as to produce a true hallucination: the voices heard are projected outwards, and attributed to objective sources if our reason be affected, attributed to disease if we are sane. "Le malade me dit un jour: 'Pensez vous quelquefois?' 'Sans doute.' 'Eh bien, vous pensez tout bas, et moi, je pense à haute

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* SPENCER: *Psychol.*, 1st ed., p. 275.

voix.'"* Griesinger cites an interesting example of the transformation of this normal process into hallucination: it was a patient who had various surprising visions which delighted him and of which he spoke freely, saying that sometimes he saw forms without colour, at other times darkened shadows, at others vivid-coloured images, having all the aspect of objects.† Griesinger also remarks that intelligent patients after their recovery have assured him that "au début c'est seulement quelque chose d'idéal, comme un esprit qui parle en eux, mais que ce n'est que plus tard qu'ils entendent réellement parler." And Sandras, reporting hallucinations of his own during an illness, says he is aware that he mistook his own thoughts and desires for external voices; these voices replied to his mental questions, like friends, but always in the direction of his desires. It is thus in Dreams. We hold disputes with interlocutors in Reverie as in Dreams, and supply them with arguments. This is temporary hallucination. In words, thoughts become sensations—*i.e.*, sensations of a special Sense, if the reduction of Speech to the category of the Senses be admitted. This will no doubt be resisted by many readers; nor do I rest my position on its acceptance. All depends upon our arbitrary classification of the Senses whether we admit or reject Speech. The suggestion to admit it is not mine; yet I will say a few words in its defence.

SPEECH AS A SENSE.

112. It may be startling to hear Language called a Sense, and the reader on learning that it was first

* Esquirol: i. 9. [illegible]GER: p. 105.

called so by an insane patient may perhaps consider it worthy of its origin. It is like the Internal Sense or Inward Eye which has gained acceptance in Psychology. According to Steinthal it is "a sixth Sense, that serves to mediate not between the outer and inner world but between the Soul and Consciousness."* It is not in this light that I view the analogy between Language and the Senses. For what is a Sense? It is an organ which *indirectly* tells of the outer world, as that outer world *directly* affects us through it. We do not *feel objects*, we *construct* them out of feelings. Every sensation is a sign; and the sign alone is at first present in Consciousness, though dragging with it oscillating neural units, which may easily sweep from this oscillating obscurity into the full energy of Consciousness, and then what is signified gradually emerges in Feeling. Language has a very obvious analogy to this. The name is a sign. When it is spoken the hearer feels it as a sound, and perceives it as a sign. If to him it is merely a sound, it has only the sonorous reaction—it sets none of the neural groups oscillating which would be awakened by the sign. It is like a sensation which is not localised. "The word," says Steinthal, "brings before Man's consciousness his mental possessions—whether some one says to us, 'N. is here,' or we really see N., is for the effect in its theoretical aspect quite the same. Here it is the inner image of our friend called up through the eye which, owing to the sensuous energy of his appearance is apperceived as a bodily presence; there the name of N. does not bring the image before us, but the whole group of our relations to this person, and this becomes equally apperceived as here present, although there is no sensible perception to aid it." I think the case is otherwise. The sensible image of N. may recall the whole group of our relations to him; and the name of N. may simply recall his image. Both sight and sound are signs; what is apperceived in them depends, firstly, on our preperceptions; secondly, on the state of our minds; and thirdly, on the interest of the moment in regard to N.

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* STEINTHAL: *Abriss der Sprachwissenschaft*, p. 436.

113. Language has another point of resemblance with Sense, and this Steinthal notices, namely, that it acts centripetally and centrifugally, is active in the formation of sound-signs when we speak, and passive in their reception when we hear the spoken words. I have also noticed the similarity of the distinction between Sensations and their images, and that between words and ideas. An idea unspoken is the image of the vocal sound-sign; an idea spoken is the mental feeling embodied in a sensation. Another point of resemblance is that both sensations and ideas are feelings, and have all the properties of feeling. Finally, be it noted, that having created a word, idea, it is only through scientific culture that we learn not to believe in an objective existence corresponding to it—we seem to render imaginary existences sensible to perception in giving them a concrete sign.

114. It has been seen that unless a word is formed there is no idea; unless the feeling takes articulate shape it remains a vague feeling and not an idea. Now the unspoken word, or idea, is obviously a faint repetition of the muscular and mental reflexes which occurred when the word was formed and uttered,

When we mentally hum a tune, or play on an instrument, or hold imaginary talk with a friend, or address an imaginary audience, it is clear that the muscular movements necessary to the *formation* of these sounds must be *ideally represented*, since if these were not articulated they would not be defined, and would not call up the regular successions, they would not by their reflex act like the articulations which have the full energy requisite for *manifestation.* But observe: Although the tones and words are *articulated* they are not *sounded;* something is wanting to complete the manifestation. If we consider the musician mentally playing on the piano we shall see what this something is. The musician *mentally sees* the instrument, and his fingers *mentally move* through the successive series of notes (perhaps he strums on the table, but this is only a consequence of the more energetic stimulus of those muscles which have been already faintly twittering); there is, however, no music for the bystander. When the orator mentally articulates his speech, he is like that musician. All the apparatus of Ideation is set going, but the instrument of Phonation is at rest, or but faintly moved. The vocal muscles sometimes twitter, but the diaphragm and chest and tongue remain unaltered. Yet the orator could no more articulate his ideas unless he had previously perceived the words through sense, than the musician could mentally play on a piano, unless there had been the sensations of playing, and these sensations were remembered. Ideas must be *re-formed* through the same neural units which *formed* them. How very difficult this formation of words originally was, and through how many baffled tentatives the organs moved before they could be co-ordinated into the imitation of sounds of distinct words, may be observed illustrated in every nursery. Nor let it be objected that we can have the same ideas expressed in different words; and that the same sounds and letters, therefore in one sense the same words, often express different ideas. This is only saying that different movements may have the same sign, or the same sign may be used for different movements.

115. It has been explained how we become conscious of Sensations and project them outside of us; but how do we become conscious of Thoughts and project them? The fact that we regard all our sensations as existing outside of us and consider them the qualities of objects, has its analogue in the fact that we consider ideas also to be phantoms passing before the Mind; and if we do not attribute to these ideas an existence in the external sphere, we nevertheless project them as *mental objects* and treat them as if they were somehow distinct from the Ego which constructs and contemplates them. This fact is very significant. I do not remember to have seen any plausible explanation of it. Yet the explanation lies near at hand when once we have seen the identity of all psychical processes. It must obviously be a process analogous to that of Perception. If we have a subjective appreciation of a sensible phenomenon, either that of a movement or of a sound or of a colour, it can only be through a revival of those neural tremors which originally accompanied the felt phenomenon. The revival is necessarily but a part of the original. Were it in every respect a revival there would be no difference felt at all. The two phenomena would

of these tones is not in raising definite images reproducing our sensations of *objects*, and giving us therefore knowledge of the outer world; but in raising unlocalised feelings, and reproducing our *emotions*. Yet although each tone has its emotional influence and is by itself agreeable or disagreeable, it is the bar, or group of bars, which determines the emotion, as it is the sentence which determines the meaning, although each word in itself may have particular significance.

When therefore speech is named a Sense, which I must admit to be a paradoxical and perhaps unnecessary extension of the term, what is rightly meant is, that the muscular and sonorous movements and sensations of the vocal organs in exercise are *perceived* during the exercise, and *revived* as motor feelings in Memory, like all other sensations and movements.

CHAPTER X.

THE SIGNATURES OF FEELING.

117. I HAVE repeatedly had occasion to refer to the signatures of Feeling, and have only briefly explained what was to be understood by the phrase. The unity of the Animal World is diversified by classes formed according to their degrees of resemblance. Orders, Families, Genera, Species, Varieties have their several groups of characteristic marks. In like manner we diversify the unity of the Mind and classify the characteristic marks of Sensation, Thought, Emotion, Volition, &c.; subdividing Sensation into the varieties of the External and Systemic senses; and each of these again into its special reactions. Every difference in consciousness has then its *signature*, or *mark* by which it is distinguished. Not only does every distinct organ yield a distinguishable class of sensations, but every part of the organ yields a difference more or less pronounced. The successive zones of the retina have different responses to the same ray of light. There is not a single spot on the skin which is not differently sensitive. Even the symmetrical points on the two sides of the body have an appreciable difference—we are never in doubt whether a feather touches the right or the left side. If an unvarying pressure be applied to successive points of the surface, there will be a

varying response from each. We cannot indeed always fix with precision the exact points touched, for this localisation is a judgment and is slowly acquired; but we feel a difference, and by this signature each sensation is subsequently assigned its locus. The pressure of the 500th of a gramme can be felt on the forehead, temple, eyelid, or back of the hand; whereas on the palm of the hand, the surface of the abdomen or the thigh, the pressure must be increased to the 20th of a gramme before it can be felt. These broadly-marked distinctions between various parts are accompanied by less broadly-marked distinctions within each class: not only do we unfailingly discriminate between a pressure on the forehead and an equal pressure on the cheek or lip, but each point of forehead, cheek, or lip yields a slightly different sensation. This is intelligible after what has been said of neural units. Every group of neural units has thus its signature or specific quality by which it is discriminated from every other. And this is true of every group of groups: every perception, every emotion, every conception.*

Herein we see how Discrimination or Judgment which has been commonly assigned to Intellect alone is exercised with extreme subtilty by Sense, even objects closely alike being distinguished for us by an indefinable difference.

118. A chief signature of Feeling is that known as Localisation. Each sensation has its own *place* in both the objective and the subjective spheres, on the sensitive *surface* and in the *system* of Experience. We localise its origin, both as regards the part of the

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* DELBŒUF: *Étude Psychophysique*, p. 25.

sensitive surface which is stimulated, and the portion of the external medium which is the stimulus. We localise the sensation of one particular pain in a tooth, of another pain in a toe; and so on. But it is by a slow process of acquisition that we are enabled thus to localise sensations. At first there is only the difference of feelings: the infant feels the prick of a pin differently from that of a burn, the prick or burn on the foot is different from one on the cheek; each feeling has its signature but has not its localisation. This is an observably gradual acquirement. Even the reflex withdrawal of the foot when pricked, which to us seems a necessary consequence, is not performed at first; the infant has to acquire this mode of relief, and until he has acquired it the withdrawal is a matter of accident. Thus it is that a surgeon about to perform an operation on the eye or lip of an infant does not need to fix the infant's hands, for the pain will not be localised, and the movement of the hands towards the spot will therefore only take place by chance, not by necessary reflex. In the course of his experiences the infant learns to connect a particular feeling with a particular spot, as the general reflex movement consequent on stimulation becomes definitely directed, and his limbs moving now in this direction, now in that, bring his hands or feet in contact with visible objects which hurt him or soothe his hurt. If on moving his hand in one direction he feels pain, and moving it away feels relief, he soon learns to localise this pain. If on moving his head in one direction he feels the sensation of brightness, he afterwards learns that moving his eyes without moving his head will suffice; he then localises the sensation of brightness in the eyes, because on shutting his eyes the sensation vanishes.

That localisation is learned through movements is strikingly exhibited in the fact already mentioned, that paralysis of one of the muscles of the eye causes the patient to localise wrongly all objects in space, but that he in time acquires the correct localisation.*

119. The Sensibility of the new-born infant is, one may say, almost wholly absorbed in organic sensation. It can hardly be said to see, although light falls on the retina and probably produces a sort of dazed effect which keeps the eyes frequently closed. Its hearing is at first most imperfect, and it probably has no very distinct tactile sensations. It can smell and taste, feel pain, temperature, and no doubt muscular movements. Slowly under the Laws of Grouping the chaos assumes shapes, more or less definite; the signatures of sensations mark some out from others, and as each is localised the objective world emerges in Consciousness. One group of sensations comes to be localised in the Visual field; another in the field of Touch; another in that of Taste; and so on. There is one large division which forms the mental picture of Self, and another that of Not-self. Slowly a general image of the Body as a whole is formed out of the particular localisations, and the infant no longer treats its toes as objects apart from itself, but as objects connected by feelings with all other feelings. Every feeling not thus localised in connection with other feelings, but only localised as the causes of particular feelings, is projected outwards and made to take its place in the general picture of the Object-World, the world of Not-self.

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* See also MILL, *Examination of Sir W. Ha* [illegible] *hy*, p. 294, for a decisive case.

120. We can all localise a sensation in the viscera, though vaguely. Only anatomists have more than a misty vision of the probable place of origin of a visceral stimulation or of its stimulus. Yet the various visceral stimulations have their signatures, and these play an important part in our Experience, little as we may be able to formulate them in Knowledge. For example, the feelings of anxiety and terror which arise from certain disturbances of the heart, have the same qualities as those which have arisen in the presence of actual difficulty and danger, but because the patient cannot localise them in the objective world, cannot assign their stimulus, they excite his imagination to invent causes of danger which are unseen. A vast amount of delusion and hallucination noticed in the sane and the insane has its origin in the visceral stimulations.

121. The external senses are more definite in their localisations; and of these the Eye has the widest range and most delicate discrimination. If a feather falls upon your hand unseen it will be unfelt, but felt if seen. The tactile impression is of course the same in both cases, but in the first case it is an impression which is not localised, not discriminated from other simultaneous surface impressions; in the second case the feeling of sight directs attention to the impression on the skin, and attention means consciousness. (Delbœuf: *De la Sensibilité*, p. 38.) The Eye is the chief directing organ, which supplements the signatures of other organs, so that when we cannot see, or mentally image, the spot affected, we are liable to misinterpret the locus of the impression. If a person suffering from partial anæsthesia be pinched or pricked,

he will localise the impression on some other spot; not on *any* other, but on one which under normal circumstances has fainter sensitiveness and consequently yields a signature most resembling that of the spot, with diminished sensitiveness, now irritated. But let him see the stimulus applied and he will correctly localise it.

122. It is because we cannot see our internal organs, nor touch them, nor clearly discriminate their movements, that we fail to localise their sensations otherwise than approximatively. This is peculiarly the case with the massive and diffusive feelings called desires and emotions. They are therefore detached from the objective world, which is constituted by visible and tangible qualities. They seem peculiarly subjective, personal. We thus separate our feelings into two broad classes of objective and subjective, according as we localise them in the surface of the body or the interior of the body; and again we separate the organs from the cosmos, all the changes in the organism being stimulations, all the changes in the cosmos being stimuli.

123. We localise all feelings, and thereby give them *positions* in the objective cosmos, or the subjective system, so that all become as it were objects of mental contemplation. Not only do we project outside of us the various sensations derived through the surface, and thus regard them as qualities of external things rather than as affections of the sentient organism (they are *both*), but we also follow this objective tendency with our emotions and thoughts: we believe that things are good or bad, dangerous or seductive: we believe that our thou[illegible] [illegible]nd go, cross the

mind, bewilder it, like moving objects: nay, we objectify the Mind itself, and call it ours, as we call the body ours. The reason is that all feelings, emotions, thoughts are connected with visible or tangible experiences, have an objective origin and locus. If with closed eyes we have a luminous sensation we project it into the outer world, just as it was projected when the eyes were open. If we imagine a colour it is always thus projected; the localisation which accompanied the signature originally, accompanies the signature now. If we think of an event, or think of our thinking process, the same tendency operates.

124. The predominance of the Eye has its disadvantages when we endeavour to explain mental processes. It has led to the universal explanation of mental processes by the analogy of vision. What we cannot see clearly we are supposed not to think accurately. All that cannot be presented in *images*, is by most writers said to be unthinkable, inconceivable, and by almost all writers regarded as inexact, uncertain. This has its parallel in the supposition that unless phenomena can be measured they cannot be scientifically known; as if quantitative exactness were the basis, and not merely a form, of certitude.

Why visual feelings should be allowed to usurp all the powers of the other feelings, no one has declared. The Logic of Feeling is as accurate and irresistible as the Logic of Images or the Logic of Signs: the judgments which connect sensations with motions, which determine impulses, which regulate conduct, are not confined to visible and tangible sensations. Sounds, scents, tastes, and systemic sensations notoriously direct actions, as certainly and effectively as sights and touches. The eye is the *measurer:* congruity between two objects or two and a third can only be seen; *coexistence* is very slightly given by other senses, these for the most part carrying only succession. The eye sees both. Hence the eye detects the chief *relations* as well as *objects.* It is the intellectual sense. Science is vision of coexistent and successive phenomena, prevision of future. *Der Mensch,* says Geiger, *ist vorzüglich ein Augenthier.*

But our experience is constituted by all our feelings; and our Knowledge which formulates these experiences is no more limited to the *imaginable* class, than it is limited to Science of the *measurable* class. The *relations,* which constitute as important a part of knowledge as *things,* are not the less certain and effective when they are wholly unimaginable. The analogy of Vision is nevertheless of great service, and we may always speak of mental vision and prevision without fear of being misunderstood, the more so since our tendency is to translate all feelings into terms of Matter and Motion which are terms of Sight and Touch. These give a definiteness to localisations; and definiteness is requisite for communication of precise ideas.

125. In conclusion let me advert to the theory of local signs which Lotze has made popular in Germany, and which differs in one important respect from that which has been expounded in the foregoing pages. Lotze starts from the Kantian hypothesis that Space is an *à priori* possession of the soul, a form of Sensibility antecedent to and independent of Experience. Every sensation rouses this into

activity: in itself, a sensation can only have *intensity*, not *extensity* or space-form. But as every sensation has over and above its intensity a peculiar *local sign*, and as these local signs form a graduated system, each sensation is not only separated *spatially* from every other, but also has its assigned place in the general picture. Lotze regards the localisation as primitive, I regard it as secondary; he identifies the signature with the localisation, I derive the localisation from a judgment, *i.e.*, from the connection of two or more signatures. If Kant's hypothesis be accepted, Lotze's must be accepted. I reject Kant, and against Lotze urge the following considerations.

126. If the localisation were identical with the signature or specific quality of the feeling, we should have no perfectly distinct feelings which had not corresponding distinctions of localisation. Now it is notorious that we fail to localise a vast mass of feelings. A still more cogent proof is furnished by the experiments of Volkmann, which show that when the same spot is selected for repeated trials its sensitive discrimination increases with the repetitions. Volkmann settled for a series of spots the smallest distance at which the two points of the compasses could be extended, so that a twofold impression should be felt. He began with a distance at which the doubleness was very distinct, and gradually lessened the distance until only one impression could be felt; then reversing the procedure he very slowly increased the distance until the doubleness was once more felt. Having thus fixed the limits for six different places—tongue, lip, finger, &c.—the series of experiments was repeated, beginning with the sixth

place and ending with the first. He found that the discrimination increased with each experiment, so that in the course of a few hours two points were felt at half the original distance; and in the hand it had so increased that two points were felt at a fourth of the original distance. Analogous experiments or visible discrimination yielded a similar result; but more with one person than with another, and least of all with those accustomed to discriminate minute differences. Now it is a point of great interest that when one hand, or eye, had been experimented on for some time, and thereby had acquired increased susceptibility of discrimination, the other hand, or eye, was found to have also acquired this. Thus when the smallest distance on the left finger was $0.75'''$ and that of the corresponding right finger $0.85'''$, these signatures preserved their characteristic values; and when repeated experiment on the left finger *alone* had reduced the distance to $0.45'''$, the right finger was found to have fallen in the same proportion, namely, $0.4'''$.*

127. Other experimenters have found similar growth of susceptibility due to attention being directed to the differences. The successive pressures of weights of three pounds and three and a half, which at first cannot be distinguished, will after several trials readily be distinguished. Who, except a postmaster, can tell by feeling whether a letter is slightly over or under the ounce? Yet every postmaster learns this, whence it must be concluded that the localisations of feeling are acquired and are not native local signs, and even the signatures of feeling

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* VOLKMANN: *Ueber den Einfluss der Uebung auf das Erkennen raümlicher Distanzen* (*Berichte* der K. K. Sächs. Gesell. March 1858).

are greatly influenced by the reactions of a modified Sensorium, and hence are educable. This means that they are not simple functions of the impressions and the neural units constituting such impressions, but are functions of these and their combinations in the Sensorium.

THE CONDITIONS OF SIGNATURE.

128. Feelings are distinguishable by their qualities and intensities. One tone, or one colour, differs from another in quality, it differs also in vividness : in the mode of stimulation and in the degree of stimulation. If Fechner's law is true, it is only in the latter respect —as a measure of intensity. That law declares that increase in energy of a sensation is not in a direct ratio with the increase of the stimulus, but is the logarithm of the stimulus. It says nothing of the specific quality of the sensation.

129. The several senses have different limits of susceptibility. The eye is capable of distinguishing intensities produced by stimuli that differ only as the $\frac{1}{100}$, whereas the ear requires a difference of $\frac{1}{3}$. Less than the susceptibility of the eye, but far greater than that of the ear, is the muscular effort, namely $\frac{6}{100}$. The skin, as regards temperature and pressure, has the same limit as the ear : $\frac{1}{3}$. Thus no increase or diminution of pressure on the skin by a weight yields a distinct sensation when it is less than one-third of the pressure—three pounds must be succeeded by more than three and a half if a change is to be felt ; but in raising a weight a difference of one-seventeenth will be felt. But this susceptibility is only

one factor: the state of the Sensorium has to be taken into account, and with it the state of the organ affected. Thus the sensation is a function of three independent variables: 1, the stimulus, or objective force; 2, the state of the organ, which may be fresh, or fatigued from a previous excitation; 3, the state of the Sensorium, which may be prevented from reacting on the impression because of some more energetic stimulation from another source. The first can be accurately measured, and its relation to the sensation is expressed in Fechner's law. The second does not admit of measurement. We have reason to believe that the vital processes of assimilation endow the organ with its normal sensibility: its molecular forces are in a state of tension, which is however incessantly being disturbed by varying internal stimulation, so that the eye has its own light; and even in the deepest darkness colours come and go, in the deepest stillness sounds are audible, tastes and scents are never wholly absent. Upon this shifting background of sensibility are detached the more definite sensations produced by external stimulations. These have the twofold effect of exciting sensation and diminishing the sensibility.

We know that excitation of the organ diminishes its sensibility, the stimulation being an expenditure of its force, an expenditure rapidly replaced by the vital processes of assimilation, but in itself a source of dissimilation.

The third condition is even more variable. One sensation may preoccupy the sensorium so as to annul the impression from another, or exhaust the sensorium. (Delbœuf, *Étude*, 47

ADDENDUM.

130. There can be no sensation without adequate stimulation, and no stimulation without external stimulus. But the contact of a stimulus with a sensitive surface does not suffice for Sensation: it must have a certain energy to disturb the neural equilibrium, and produce an excitation; further, that excitation must reach a certain level of relative intensity to produce a change in the state of consciousness. Thus a stimulus may act without producing adequate excitation, or the excitation may discharge itself without producing sensation (*i.e.*, conscious sensation). This change of relative intensity is not produced simply by increasing the intensity of the stimulus: Sensation does not rise and fall *pari passu* with the rise and fall in the stimulus. The law of stimulation formulated by Fechner—that sensation is as the logarithm of stimulus—is an abstract ideal construction which may be accepted as such, although criticism has shown that as a concrete expression of the facts it is inaccurate. The law has to be supplemented by that of central reaction. The intensity of an excitation depends on the level of excitability and the psychostatical condition. Thus it is that the crash of a bullet may be unfelt.*

Now just as the stimulations which do not reach the energy of excitation were nevertheless vital processes of the same kind as those which do reach it, and never lose their character of vital activity, so the excitations which do not reach the level of conscious states are nevertheless sentient processes of the same kind as those which do; and they never lose this character to sink into merely physical processes. Sensibility, general or particular, may be represented by a curve: as it rises above the level of excitation it rises into the stage of consciousness, which having attained its maximum sinks into subconsciousness, and without changing its course falls to the level of unconsciousness, perhaps again to rise with like gradation.

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* Take this analogy: the contractility of muscular tissue is always active. The inaction of different muscles and different parts of the body does not imply a relaxed condition, but implies, as Müller says, that the different groups of muscles antagonise and balance each other; and when the position of a part is changed from the medium state of *apparent rest*, one or more of the muscles already in a state of antagonistic action are merely thrown into more powerful contraction. The same relations may be applied to Sensibility in the nervous tissue.

131. From first to last there has been an excitation which discharges or *tends* to discharge itself in a movement, and blends with other excitations into a group—sensation, emotion, idea, volition. Excitation then is the fundamental fact; consciousness, subconsciousness, and unconsciousness are its gradations of intensity, the ordinates of the curve. With this conception we have no difficulty in understanding how mental processes may pass unconsciously without losing their psychical character; for Consciousness is not an agent but a symptom, and a symptom not of any special organic process or of any constant energy of such process, but simply of the relation of that energy to simultaneous activities. A stimulation pursues its normal course, produces its normal effect, and is thus a factor in the working of the Sentient mechanism. If it is below the level, or if it has no escort of excitations above the level, it is then said to be "not accompanied by consciousness;" this means

that in and for itself the movement has had neither the interest which connects it with Feeling, nor the significance which connects it with Thought. As an example, consider the somnambulist who moves securely through a crowded room, sees the objects and persons (since he avoids them) but is not conscious of them, they having no interest or significance for him; whereas he sees and is conscious of the objects which enter into his dream-pageant, and have an escort above the level.

132. That which is true of particular excitations, according to Fechner's law—namely, that the stimulation must reach a certain level (Fechner calls it the *Schwelle* or threshold of consciousness)—is true of the sum of excitations which is the abstract Consciousness or Ego. Our mental activity is for ever alternating between the upper and under levels of excitation; and for every change in consciousness there is needed a rise in intensity on one side which involves a fall on the other. There is thus a stream of Consciousness formed out of the rivulets of excitation, and this stream has its waves and ground-swell: the curves are continuous and blend insensibly; there is no breach or pause. Any increase in the excitability of a particular organ, or neural group, will by raising its level give it a relative prominence, so that for the instant it will constitute the consciousness. And under the incessantly fluctuating waves of special sensation there is the continued ground-swell of systemic sensation, emotion, or ideal preoccupation, which from time to time emerges into the prominence of consciousness; and this, even when below the waves, is silently operating, determining the direction

of the general current, and obscurely preparing the impulses which burst forth into action. Consciousness is composed of Feelings, and Feelings are composed of elementary excitations: besides the fluctuations of wandering attention raising the level now here and now there, we must take into account the fluctuations of Moods—each Mood being conditioned by residual feelings of systemic stimulation.

133. The unconscious processes not only form by far the larger part of our mental activity, but are necessary to the health of body and mind; for the harmony of the various organs, their consensus towards definite ends, is disturbed by every alteration of level bringing into consciousness processes which ought to pass without such relative prominence. It is necessary, for example, that our visceral functions should go on without our consciousness, if we are to pursue a train of thought or conduct having no direct reference to such functions; but it is necessary for these functions that they should be regulated by sentient excitation, and that when there is any defect in their conditions of healthy activity, this excitation should rise to the level of subconsciousness or even consciousness. The feelings of hunger, thirst, need of fresh air, &c., are imperious in their calls on attention. But these and other feelings are often the consequence of hyperæsthesia or of anæsthesia. Then the mind is forcibly called to them. Every beat of the heart, every inspiration and expiration, every movement of the intestine is felt, and if there be hyperæsthesia in the cerebral centres, this local irritation is the origin of a melancholy mood, or of some hallucination.

CHAPTER XI.

THE AFFECTIVE STATES.

134. A PHENOMENON may be accurately observed by us although we are incapable of explaining it. Such observation, valuable as knowledge, becomes greatly increased in value when it is explained, that is to say, when the fact is assigned to its principal factors, and our vision of the product is enlarged by a vision of its statical and dynamical conditions. In the functions and faculties of the organism we have conspicuous facts of observation which admit of description and classification, even before we have ascertained the organs and the mode of operation of these organs; but, as Comte remarks, "dynamical studies however skilfully conducted will never yield anything but vague results, until they reach some statical conclusion, whether that conclusion be verified or hypothetical;" and it is this conviction which has led men from the first to seek for the several organs of the several functions, and when failing in the search, to *imagine* what could not be *found*.

135. The sentient functions and faculties have been observed and classified. Something has been done in the way of assigning their organs; but much more remains to be done. We have been able to assign certain classes of Feeling to particular organs—the

visual to the eye, the auditory to the ear, and so on. But we have also learned that Feeling is not the process in these organs, which are only channels for particular modes of stimulation. Besides these special feelings, Sensation, Thought, Volition are generally understood to be functions which also have their organs. If so, the organs are absolutely unknown. *Where* the functions take place, and *how*, are mysteries which some men explain by mythologies, and others by guesses. The mythological entities of sensitive and rational Souls, spirits inhabiting the organism, are now discredited. The hypothetical organs described by physiologists are in high favour, and may be regarded as "first approximations," even by those who recognise their inadequacy. The imperfection of our real knowledge forces us to supply by imaginary sequences the gaps of ascertained sequences. Nor is Imagination to be distrusted and thrown out of court. It is only by the successive transformation and correction of hypotheses that Science advances. The physiological hypotheses now in vogue are at any rate directed by the rational aim of finding *in* the organism itself the agencies by which its operations are effected. The correction and transformation of these hypotheses must therefore proceed in the same direction, though with fuller knowledge of the details of operation.

Instead of looking out for organs of Sensation, Thought, and Volition, our first correction will be to cease regarding these complex products of Sensibility as if they were the special functions of special organs: we shall view them rather as class-names for different responses of the sentient organism;

of *organs*, our search will be for the *combinations of organic processes which determine these responses.*

136. Sensibility is a general property which is assigned to the Nervous System. Yet observe the contradiction which first assigns the direction of all the actions of the organism to Sensibility, and then, forgetting that this belongs to the Nervous System throughout its parts, isolates one part from the rest, and assigns the seat of Sensation to that part. It is thus men have come practically to ignore the Nervous System in favour of the Brain, and to identify Psychology with Cerebral Physiology. Sensation, Thought, and Volition are by them localised in the Brain, while every neural process in other parts of the system is relegated to mechanical innervation and mechanical reflex, destitute of all psychical quality.

137. The task of the psychologist is to ascertain by objective and subjective analysis the *several organic processes* which are *combined* in the production of sensations, thoughts, and volitions, as *acts of the organism*, and explain these, so far as may be, by reference to their statical and dynamical conditions. His first division will separate the motor-mechanism from the sentient mechanism which sets it going, the actions from the motive forces. He will view these first objectively, from the side of Physiology, which treats the organism as a mechanism from which Feeling is eliminated; and then view them subjectively, from the side of Psychology, which treats of Feeling without reference to the material mechanism.

138. On the objective side, the organism appears as a complex mechanism, the various organs being in
pendent mechanisms, individual in structu

separately excited, disturbed, or arrested in action. It is to the individual mechanisms that special modes of activity are due. Flight is the activity of a wing-apparatus; Vision of an ocular apparatus; and so on. But with this speciality of mode there is a generality and community of nature; with this independence and individuality there is an indissoluble dependence and solidarity, which is far more absolute than the dependence of parts in an inorganic mechanism. Each organ we find to be directly dependent on some other organ and on some group of organs, while indirectly it is dependent on them all. Its functional activity is thus doubly determined, first by its own structure, and secondly by its connections. No organ acts functionally by itself; its action is that of the organism through the special organ.

139. The combination of organic activities is effected through the agency of the central nervous system, and the flexibility of combination depends on the possible variations in the nervous adjustments. For example: birds have vocal organs capable of being combined so as to produce cries and songs, and, in some birds, *articulate sounds*, imitative of words; but no bird is capable of Speech, because, although the articulating vocal mechanism is there, the nervous adjustments connecting this mechanism with other nervous adjustments, and making the mechanism the expression of thought, are wanting in the bird.

140. The elementary form of nervous adjustment is what is called the reflex arc. A sensitive surface is connected by a nerve with a portion of central substance, which on being excited reflects the excitation [illegible] pulse through an outgoing nerve, and

this excites the contractility of a muscle. This reflex arc, remember, is only an analytical element. Synthetically we must restore it to its place in the system. The portion of central substance which transmits stimulation from surface to muscle is only ideally separable as a portion; in reality, the whole central mass is affected when any point of it is excited, so that if the reflex arc has its central point of incidence and reflection, this is also a point of connection with the nearest arcs, and it reflects its excitation upwards and downwards on these arcs no less than outwards on the motor nerves. We have already had occasion to consider this fundamental law of Sensibility both under the aspect of Irradiation and of Restriction. Here we only note that since all organs are innervated from the central mass, and since every excitation at one point in that mass is irradiated with more or less energy throughout, we see that the solidarity of the organism depends on this irradiation, and that, in spite of the independence of organs, there is always an *inter*-dependence of functional activities in varying degrees of energy and complication.

141. Let us now quit the objective for the subjective point of view, and consider the functions and faculties as expressions of Sentience. We must approach them through the nervous adjustments which are the determinants of actions, and our analysis must, therefore, at first be both physiological and psychological, considering now neural processes, and now feelings, which are the equivalents of neural processes. No objection can reasonably be raised to this procedure, now that the universal consent of investigators has localised sentient phenomena in the

neural mechanism, at least so far as a physical localisation of psychical events is held permissible at all. The only difference among thinkers on this subject is whether or not the said adjustments are of two distinct orders, namely, physical when they are limited to the spinal portion of the central mass, and psychical when they take place in the cerebral portion of the central mass.

142. The reader knows the view I hold on this point. In many places I have had to protest against the detachment of the brain from the rest of the system, and the assignment to it exclusively of properties which belong to all central masses, without of course denying the speciality of its functions as determined by speciality of connection. Whatever special modes of Sensibility may be the responses of the stimulated cerebrum, they must, like all other responses, have the twofold determination, already noted, of irradiation and restriction. Whatever office the cerebrum may play in the sentient mechanism, the cerebrum is only a part of one continuous centre, a part of one neural mechanism. When we assign the special office of Manipulation to the hand, we do not thereby assert that the hand is no part of the general neuro-muscular system; that its muscles have other properties than the muscles of the back, the tongue, or the eye; that the laws of combination are exceptional; that the sensations which accompany the acts are not muscular sensations; and so on. It should be thus also with the brain. If it is to be credited with any special functions, it can be dissociated from the rest of the system *only* in regard to this speciality. Meanwhile, we must remember that its special func-

tions are up to the present date absolutely unproved. They are guesses, more or less ingenious. And if the guesses are one day verified and the functions proved, they will not establish the current notion of the brain being the exclusive seat of Sentience, unless two points are also proved, namely—1°, That none of the phenomena classed as sentient are manifested in the absence of the brain; 2°, That Feeling is something as distinct from Sentience as Vision is from Hearing, a special mode of Sensibility which demands a corresponding speciality in the organic process.

Now, of these points, the first I have exhaustively refuted by showing that although removal of the brain is such a disturbance of the normal mechanism that it destroys the possibility of many forms of sentient activity, yet it leaves other forms still active —the brainless animal still manifests some sensations, some instincts, and some volitions in organic activities which are thus interpreted when the animal is in its normal condition. With regard to the second point, unless we reduce it to a question of definition, it is one which is absolutely unverifiable.

143. We stand, then, on the position of Physiology that Sensibility is the physical side of Sentience, and that all the different forms of Feeling are different modes and complexities of Sensibility; and we are guided further by inductions which point to Sensibility as at first a general property of protoplasm, which becomes more various in its energies and modes as protoplasm becomes neuroplasm, and neuromuscular tissues are differentiated and integrated into systems and organs. Hence we conclude that from first to last Sensibility remains a vital property of the

organism, which becomes more and more centralised and specialised in functions and faculties as the organism becomes more differentiated. The centralisation is in the Nervous System, the adjustments of which direct and combine the Muscular System.

144. This being so, our search for the special conditions of each particular mode of response must always be guided by the conception that they are organic processes which are also in varying degrees of energy and combination recognisable in all other modes of response. Even when we have traced the special conditions of some function, and traced these to a particular mechanism,—as, for instance, when we have assigned the particular mode of response called Vision to the ocular apparatus, and every variation in this response to some variation in the apparatus,—we have only explained the speciality of the sensation; we have still to explain the reaction of the Sensorium which constitutes the visual feeling, its affinities with all other modes of feeling, and its direct action on the other parts of the organism. In other words, while the *mode* of response is specially determined by the organ and its mode of stimulation, the *response* is that of the organism, or more particularly the Sensorium.

145. Sensibility, which is thus assigned to the Sensorium, has three processes: Stimulation, Grouping, and Motor-impulse. The division is artificial. In reality there are not three processes, but one Triple Process, which operates in all central reactions, as I have endeavoured to show. These have been severally personified in the abstractions Sensation, Thought, and Volition,—or Sense, Intelligence, and

Will. For these personifications separate organs have been sought and assumed, in the same way that separate organs have been assigned to Vision, Touch, Manipulation, &c.; but it will be well to keep a standpoint of generality, and connect a provisional dynamic classification with a vague and provisional statical classification, assigning classes of symptoms to general processes without pretending to more precise localisations than present knowledge justifies.

Thus, looking at the phenomena and at the organism from this general stand-point, we note two great classes, the Affective and the Active, which correspond with the two general properties Sensibility and Contractility. The web is constituted by threads of sensible affection and motor-impulse. These threads are woven into numberless patterns. The sensible affection which connects the organism with its environment is discharged in a motor-impulse, which acts on the environment through the muscles. Between this reception and this discharge there is the grouping process, which fashions the Inner Life. Logic (Thought) is thus the *internal* function of the Sensorium, as Sense and Movement are its *external* functions.

146. These three terms of the sentient process are analytically personified under the respective heads of Affective, Intelligent, and Active.

The Affective embraces sensations, desires, emotions,—the whole range of what is specially called Feeling. The affective mechanism will therefore be the central nerve-substance, with its ingoing and outgoing nerves, under the immediate stimulation of some contact with stimuli; while the particular mechanism of any one sensation or emotion is the activity of some special adjustment in some portion of this varied system.

The sensations are systemic and special. Commonly it is only the activities of the five special sense-organs, Eye, Ear, Nose, Tongue, and Skin, which are indicated when sensations are spoken of by philosophers, although philosophers join with ordinary men in speaking of sensations of Hunger, Thirst, Fatigue, Pain, Heat, and Cold, "Goose-flesh," and of feelings of Depression and Exhilaration, Effort, &c., which cannot be assigned to the sense-organs. All such sensations are excitations of the affective mechanism, and because they severally arise outside the restricted circle of the special sense-organs, I have called them the Systemic.

The nervous system ramifies throughout the organism, and must constantly be stimulated from every part. In every part there is incessant molecular change, storing up energy in Nutrition, and expending energy in Reaction. Every reaction will affect the Sensorium. This granted, we must conclude that sensible affection is the product of every excitation of nerve and centre, unless we can prove that only particular nerves and centres have this exclusive form of activity. Sensible affection is infinitely varied in its modes, dependent on the variations in the stimulation. Some of these are definitely localised in particular organs, which are thus named the Senses. Others are not so definitely localisable. They cannot even be more precisely classed than as the Nutritive, Respiratory, Generative, and Muscular Senses: the sensations of hunger, thirst, secretion, excretion, &c., being grouped as the Nutritive; the sensations of suffocation, lightness, &c., as the Respiratory; the sexual functions as the Generative; the sensations of effort and fatigue as the Muscular. Discomfort, Depression, &c., are more general and indefinite still; and Pain is almost universal.

147. Sir Charles Bell had a strong though dim conviction that it was an error to limit Sensation to the action of the special senses. "It appears to me," he says, "that the frame of the body, exclusive of the special organs of seeing, hearing, &c., is a complex organ, I shall not say of sense, *but which ministers, like the external senses, to the mind;* that is to say, as the organs of the five senses serve to furnish ideas of matter, the framework of the body contributes, in certain conditions, to develop various states of the mind." * Although this is very vague, and, because of its vagueness, has found little acceptance, we see that the phenomena had not escaped Bell's attention. As he proceeds he becomes still more vague; and thinks that because a blow on the eye will produce the sensation of a flash of light, which proves that the organs of the senses can be exercised when there is no *corresponding* outward impression, we can comprehend how other organs of the body may have a relation established with the mind without reference to outward impressions. As an anatomist, it behoved him to indicate by what kind of mechanism this relation was established. I have done so by referring to the one mechanism which, in the case of the external senses, we know to be operative—namely, the connection of nerves with their ganglia: wherever a nerve excites a ganglion, there will be Sensibility. The

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* BELL: *The Anatomy and Philosophy of Expression,* 4th edit., p. 83.

visceral-nerves excite their ganglia, the muscle-nerves excite their ganglia, the skin-nerves excite their ganglia, and the nerves of special sense excite their ganglia: the physiological process is in each case similar, although the sensations produced are necessarily various. Bell seemed to be very near the truth at one time, as may be gathered from the following passage:—"It is a singular fact in the history of physiological opinions, that the heart, an organ the most susceptible of being excited by the agitations or derangements of the body, should have been considered at one time as insensible. And yet in one sense it is true that it is so. To actual touch the heart is insensible, as was exhibited to the illustrious Harvey in the person of a young nobleman who had the heart exposed by disease. This single circumstance, had there been no other evidence, should have earlier directed physiologists to a correct view of the matter, from its proving that the *internal organs are affected and united by sensibilities altogether different in kind from those bestowed upon the skin.* The sensibility of the external surface of the body is a special endowment adapted to the elements around, and calculated to protect the interior parts from injury. But though the heart has not this common sense of touch, yet it has an appropriate sensibility, by which it is held united in the closest connection and sympathy with the other vital organs" (p. 86).

Some of the difficulties resulting from the traditional restriction of the term Sensation may be avoided by speaking of the systemic sensations as feelings. To us this is all the easier, because we understand Sensation to be only a mode of Feeling. But, however named, the fact must be clearly apprehended, that feelings arising in the system at large not only have the same psychical significance as the feelings arising in the special senses, but also form the massive motive forces of the organism.

148. The artificial nature of the separation is easily shown. Thus the organ of smell has been assigned because certain stimulations of the mucous membrane lining the upper portion of the nasal cavity produce a particular response—the sensation of odour. But other parts of this mucous membrane, no less than the membranes lining the air tubes and intestines, also respond to stimulations of a different order. No one calls these sense-organs; every one admits their activities to be sensations. Why are they not called sense-organs? Partly, no doubt, because only the sensations of smell were early assignable to objective stimuli, and had recognisable relations to the actions of the organism; smell was important to the animal, and therefore became *intelligible;* whereas the other modes of response of the mucous membrane were vague, unimportant, and little noticed. And when Science came to systematise experience, it found that although the Nose had other functional uses besides that of Smell, it was this particular use which fixed attention; whereas the other functional uses of the air tubes and intestines so predominated over the sensations they furnished that no one thought of them as sense-organs.

149. It would be idle to disregard the established nomenclature. I shall therefore continue to follow it in general, and speak of the Senses as the special classes having the five special organs, and range

under the term Systemic all other kinds of sensation. "How many senses have you?" asks the traveller from Sirius (in Voltaire's *Micromégas*). The inhabitant of Saturn replies: "Seventy-two; but every day we lament that we have so few." We might have told the Saturnian that our senses were not less numerous, and that our limitations consisted in the obstacles which prevented so many of them from being intelligibly connected with objects in the external sphere. Our knowledge of objects is mainly, though not exclusively, furnished by the special senses; not exclusively, for *resistance*, which is felt through the muscular sense, and *pleasure* and *pain*, are as invaluable elements of cognition as colour, scent, or taste; the *terror* excited by darkness is for those who feel it a quality of the darkness as much as its visual character. The systemic sensations, desires, and emotions furnish Intelligence with abundant material and motive force.

150. In the lowest animals, with their slightly differentiated structures, the systemic sensations must constitute a large part of their Sensibility. They are impelled to act by internal stimuli, aided only, if aided at all, by impressions of contact. Any sensations they can have must be to a large extent rudimentary forms of Appetite, desires agitating them till co-ordinated movements bring means of relief. The nutritive and reproductive feelings form the nucleus of their motive forces. Such knowledge as they can be credited with will be limited to the intuition of movements necessary to attain and master food and female. A little higher in t [illegible] ere is added to this systemic nucleus [illegible] cial sense:

localised sensibilities to light, odours and sounds mingle themselves with the general excitations, and give their particular direction to the actions. Thus, Sight, Smell, and Hearing complete the sphere of special sense. Each organ, on its appearance, not only becomes the channel for a new order of impressions, and consequently new directions of the movements towards food and female, with derivative influences in the struggle with rivals and external obstacles, but is also indissolubly blended with the systemic sensations, modifying them and modified by them. Knowledge has a wider range, but still the primary and persistent impulses are the systemic. The senses only subserve these.

151. When and how the peculiar modes of Feeling known as the pleasurable and painful arise is a profound mystery. One thing is quite certain, namely, that a vast amount of sensible affection is without these qualities; even in highly developed human organisms sensation is often pure excitement, without a shade of pleasure or of pain; and various degrees of these qualities accompany excitement of the same intensity. In the less highly differentiated organisms there is probably no pain, nothing more than the discomfort of irregular responses in a disturbed mechanism, the *creaking* of the machine. But of course, whenever Pleasure and Pain exist, they are powerful influences in the direction of actions.

152. The affective responses massed in Tendencies and Appetites, which in their higher forms, when directed by complex Intuitions, are called Instincts, form the whole of the psychical activity of the low
animals, and the large ground-lines of the

of the highest. The Logic of Feeling, the nexus of experienced relations wrought into the organism, supplies the real motive forces.

153. It is obvious that the addition of special senses, however important its influence, cannot be a displacement of the systemic. If we suppose an organism without special senses, all its movements when co-ordinated to an end will be directed by organised adjustments, integrations of feelings, which will represent what in higher forms are called intuitions and instincts. Now add new senses, and although these will create new excitations and new integrations which will determine new directions of movement, they will blend with, not obliterate, the primary impulses. A new sphere of Consciousness will have arisen with this new range of reponses. This in time will acquire a certain independence, as all organs and all functions acquire it. The Senses are stimulated from without, variably, and therefore independently, of each other and of the systemic class; they thus acquire a certain degree of autonomy. Although never wholly freed from dependence on the systemic ("we only see what interests us") and the solidarity of the organism, the sphere of Sense may be considered as something apart. The several organs may be active without being prompted by desires; their excitations are associated *inter se*, very much as images and ideas are associated by laws of Ideation, quite irrespective of the sensations they represent and symbolise.

154. The Emotions, which up to this point were rudimentary, now begin to assume something of their complex composition in the blending of special with [illegible] and the Logic of Feeling. Emo-

tions are to be viewed under two aspects—as sensations and as impulses—as Feeling and as Guidance. Under the first they belong to the systemic more than to the special affections, but are complexes of both; and under the second, when completed by intuitions and conceptions, they rise into Sentiments. They differ from systemic and special feelings in being more energetic and diffusive excitations; they cannot therefore be localised in organs. It is true that some one of the viscera is always conspicuously affected in each kind of emotion, and hence the popular assignment of anger and terror to the heart, grief to the intestines, tenderness to the generative organs, and so on; but the wave of agitation has a wide sweep exciting the whole organism; and although certain visceral states produce the emotion of terror (in the absence of any objective cause), and the emotion of terror produces such visceral disturbance, although anxiety produces palpitation of the heart, and palpitation produces anxiety, these are only conspicuous phenomena in the complex of organic disturbance. The secretions are all affected; the veins swell, the respiration is arrested or accelerated, the muscles are agitated in a disorderly manner, the ideas are tumultuous.

155. Experiment, by the application of delicate tests, has shown that all sensation is irradiated throughout the system, and with more or less energy affects every organ; and at the early stages of our sentient existence each sensation produces a general disturbance. By degrees the wave of impulse becomes restricted to definite channels, and all the outlying effects become inconspicuous from their faintness, or their *insignificance*. Ceasing to be

significant, they are not attended to; only the more important effects emerge in consciousness. Emotion is sensation on a more powerful scale, greater in energy and wider in range. But it also tends to become more restricted to definite channels, and in proportion as this is the case, the emotions become elements of Intelligence, that is, of Guidance. Surprise, for example, is mild Terror, which may be a pleasurable or painful shock: it is an effective impulse towards Interpretation, and therefore a source of Knowledge; whereas the profounder agitation of Terror only leads to violent impulses which prevent a survey of the objective conditions. Passion is blind. All Cognition is founded on Emotion, but it is only from the less violent and more restricted forms of this agitation, such as Desire, Curiosity, Interest, that the higher forms of Cognition issue. Expectation and Hope are more intellectual than Anxiety and Anger.

156. The Emotions are pleasurable or painful, expansive or depressive, according as the agitation of the organs is orderly and rhythmical, or disorderly and unrhythmical, which means according as the excitation is so irradiated that the normal dependence of the convergent actions is preserved and only their energy exalted, or else that this normal dependence is interfered with by an exaggeration or arrest of one or more of the organs. The harmony of the organic actions is pleasurable and the discord painful; and Musical Emotion, which furnishes the metaphors, will also furnish a physiological interpretation. Why Anger, Jealousy, Awe, &c., should disturb the harmony of the consensus, and Joy, Hope, Love, &c., should permit the harmony, may be rendered intel-

ligible by an analysis of the conditions of each class: the first are previsions of obstacles, the second of facilities.

157. There are emotional temperaments, as there are sensual and intellectual temperaments; that is to say, individual organisms in which one or the other of these modes of response is conspicuous. The wave of excitation may issue chiefly in one of the three spheres, and although all three are really affected, yet the predominance of the one is necessarily at the expense of the other; which explains the autonomy and seeming independence of each. The emotional temperament is that which is most energetic, the emotions having the greatest motive force and ideas the least. Hence Character is not measured by Intellect, for Intellect can only prompt in company with Emotion. The feeling of resisted effort which arises in an intellectual perception of inconsistency or contradiction is a very faint emotion compared with the actual resistance of some obstacle to action; and the pleasure of success or the pain of failure in solving a contradiction, although the same feeling of relieved effort as in overcoming an obstacle, and disclosing therefore the affinity of the intellectual and emotional processes, is much feebler in energy.

158. All emotions in the beginning are egoistic, and their root-manifestation is probably a form of Fear, which in the reaction of its relief is the initiation of that emotional ease called gladness or joy. In the collision of appetites, whether of hunger or sexuality, arise the aggressive and defensive impulses, which would remain fiercely and solely egoistic but for that sense of dependence on individual beings or o

selves which lies implicitly in the sexual and parental relations. With the enlargement of the mental range in the human being, and under that influence of the social medium which raises emotions into sentiments, the consciousness of dependence is the continual check on the egoistic desires, and the continual source of that interest in the experience of others which is the wakener of sympathy; till we finally see in many highly wrought natures a complete submergence (or, if you will, a transference) of egoistic desire, and an habitual outrush of the emotional force in sympathetic channels. True, the same enlargement of perception and imagination brings with it more elaborate forms of egoism, and civilised man is still a beast of prey directing murderous artillery for the satisfaction of his more highly differentiated greed. Appetite is the ancestor of tyranny, but it is also the ancestor of love. The Nutritive instinct, which urged the search for prey, has ended in producing an industry and ingenuity of device which is its own delight, a conversance with the external universe which is sublimely, disinterestedly speculative; the Reproductive instinct has ended in producing the joys and heroism of devoted love, the sacred sense of duty towards offspring; and both instincts have been at work together in the creation of the sentiments which constitute our moral, religious, and æsthetic life.

159. These instincts, with their sequent emotions and sentiments, constitute a large province of the affective sphere. The final issue of every psychical affection, sensible, intellectual, or volitional, is always
ement of some kind directly excited by a feeling

of some kind. The movement may be simple or complex, involving a single organ or a group of organs, and the feeling which is the cause may be due to the direct stimulation of the organ or group of organs, or to the indirect stimulation of some remote organ: the movement of the eye may be caused by a sensation or by an idea. The latter is only possible when certain nervous adjustments have been so connected that the excitation of one is reflected on the other, and thus a dependent sequence of reactions is established. The action originally excited only by a direct sensation now comes naturally into play when its mechanism forms part of a wider mechanism and this is stimulated. The several experiences which we acquire of individual objects are condensed in single perceptions of the objects, so that the sight recalls the scent, the taste, the touch, and the sound, and any one of these elements of the perception suffices to direct the final discharge of action. In the intuition of an event, a plan, a course of conduct, are condensed the experiences which have accompanied similar events, plans, and courses, so that the intuition is now a prompting and a guidance for all the several actions. And what is here so readily appreciable may also be recognised in the obscurer processes which take place in the systemic and emotive promptings and guidance. The primary effect of systemic sensations is not to form distant and indirect excitations, but immediate reflexes on the organs: definite connections with special sensations and ideas arise from such sensations, but they arise slowly, gradually. In the course of psychical
tion, these sensations become, as we said

Tendencies; that is to say, call up certain nervous adjustments which are reflected in combinations of muscles, so that the organism is definitely determined in certain directions, and its conduct regulated by this mechanism with unalterable precision. These nervous adjustments, considered in their intellectual aspect, are intuitions; in their volitional aspect, instincts, habits.

CHAPTER XII.

THE INTELLIGENCE.

160. WIDER in range and lower in energy is the class of feelings constituting the Intelligence—intellect, thought, the ideal world. By classing the phenomena of Intelligence under the general head of Feeling we restore the unity of psychical phenomena while recognising their diversity; the facts designated by the terms Sense, Intelligence, and Volition are taken as simply different modes of manifestation of the same sentient organism, in each of which there is the Triple Process of Stimulation, Grouping, and Motor-impulse. Considered separately as Modes, these are indeed so diverse that it is not wonderful men should have taken them for different agents. Although images, ideas, and intuitions stand for systemic, sensitive, and emotive states, as symbols stand for the things signified,—although they too are sentient states, yet they seem so removed from the sensations and emotions they represent, that only by a patient induction could we have learned to connect the two with one common basis. The sentient states which are classed under Intelligence are as specifically different from those classed under Sense as systemic feelings are from special sensations; the diversity in their excitation and their flexibility of association

gives them a greater independence. Although they are primarily determined by systemic feelings and desires, although they have always a remote and final reference to personal needs, yet they become impersonal and objective in their higher forms, and their combinations are to a great extent determined by laws peculiar to themselves, over and above those common to all other feelings, so that Speculation transcends and even contradicts the combinations of Sensible experience. It is in virtue of this optional combination that the office of Intelligence is *regulative.* The motive forces are the affective states, and these are excited to action either by the direct stimulations of the sensitive surface or by the indirect stimulations of the Sensorium, namely, intuitions, images, and ideas.

161. When we call a man or animal intelligent, we mean that he shows a readiness in adapting his actions to circumstances; and he is more intelligent in proportion as he recognises similarities amid diversities, and diversities amid similarities of circumstance, by these means guiding his conduct. To know an object is to reproduce in memory the various experiences which we or others have had when this object has been presented under different conditions and to different senses. We know that this coloured form has a sweet taste and soft firm touch; we know that this black powder explodes when a spark comes in contact with it; and this knowledge is the registration of experiences, whereby the sight or name of the plum or the powder calls up an escort of images which are equivalent to actual sensations. We do not need to taste and touch the [illegible]r do we need to

explode the powder. Our knowledge guides our acts. Intelligence is the sum of all our various registered experiences. No amount of knowledge *in general* suffices to replace particular experience. Great as was the Intellect of Aristotle, manifested in the directions of experience possible to him, he would have been incompetent to adapt his actions to the explosive properties of gunpowder, had the powder been placed within his reach; he would have been as blind to them as a dog. But after once seeing the spark produce an explosion, this experience would be recalled by the sight of powder and approaching spark; he would then know what would be the consequence of their contact, and this knowledge would guide his actions in regard to powder. Intelligence being coextensive with knowledge, or the revivable escorts of sensations, the greater the range and vividness of the escorts, the greater the power of adapting conduct to the exigencies of the occasions. There are, of course, individual differences both in the range of actual experiences and the vividness with which these are reinstated: upon the latter depends that acuteness of Discrimination and readiness of Comparison which characterises the penetrating and comprehensive minds. There are some minds of great agility and acuteness in marshalling their experiences and discriminating them; some minds, being most vividly impressed with the proximate relations (the so-called practical, concrete minds), are less capable of wide-reaching comparison, and are often misled by their very acuteness; other minds are vividly impressed by remote relations, and these have a tendency towards theoretic constructions which somewhat disturbs the perception of present relations. The lowest grade of Intelligence is the discrimination of present means to immediate ends—the selection of food, the issue of escape, &c. : it is here limited to the Logic of Feeling. The highest grade is what we may specially designate Intellect—the discrimination of indirect means to remote ends which has been elaborated by the great instrument of abstraction, the Logic of Signs.

162. Intelligence, physiologically viewed, is the sum of the nervous adjustments which determine the secondary nervous adjustments on which organic actions depend ; and, psychologically viewed, the sum of organised experiences which determine conduct. The separation between the two grand orders of nervous adjustment—the differentiation of intelligence from sense—is the result of an ever-increasing complexity of the organism and its experiences. In the simple organisms the two are one. Motion follows only on direct stimulation. In more complex organisms the stimulations are compounded. An intuition, an image, a conception, originally formed out of direct stimulations, now replaces them. When these are established, they constitute a mode of response for the organism, which is in so far independent that it follows its own laws, one thought exciting another without the need of an intermediate activity of the senses which originally furnished the thoughts, as one word often revives another by assonance and not by meaning. It is on this ground that we explain how, although ideas are representative of sensations, they are often combined in a manner which is not that of the sensations. Our thinking is sometimes false,

and sometimes corrects the falsity of our sensations, as when we know that the illusions and hallucinations of sense are not true presentations of the external objects.

163. It is to this separation of the Intelligence into a sort of autonomy that is due the discrepancy between our thoughts and actions. Our actions being really dependent on organised tendencies, habits, &c., the ideas must act through them. Now the ideas themselves are partly determined by habits of thought acquired through Education and submission to Authority, and partly by the emotions; and when the habits of thought are not in harmony with the emotions and tendencies, we must in vain expect these feebler impulses to control the stronger. Bacon finely says, "Men's thoughts are much according to their inclinations, their discourse and speeches according to their learning and received opinions; but their deeds are after as they have been accustomed."

164. The autonomy of intelligence is manifest in certain mental maladies, such, for instance, as Apathy and Dementia, wherein the normal connection of thought with feeling is seriously disturbed. The apathetic patient finds a difficulty in connecting the images and ideas which traverse his mind with the emotive impulses which normally would be stirred by them. Images and ideas being at all times *signals* and not *motors*, it is noticeable, even in perfectly normal states, that many thoughts never become realised in act, as many mentally formed phrases are never uttered in speech. This independence, which gives us the power of spontaneous combination and constitutes the mental range, is exaggerated in disease;

and the apathetic patient allows trains of thought to succeed each other without their determining any actions; or the actions are incoherently excited, some ideas exciting the emotive forces, others not.

165. There is an error current respecting Intelligence which regards it as a distinct function having its separate organ, not as the abstract expression for the sum of intuitions, images, and conceptions, which result from manifold experiences. Intelligence is artificially separated from the affective sphere although emotions precede cognitions, and cognitions are only representatives of emotions and sensations. We only know what we have felt. Feeling at first expresses itself in reflex actions, and thought may be said to consist of residual signals, the organised result of such reflexes; the sign (image, idea) here takes the place of sensation as the initiator. How even in gestures, when habitual, there is a tendency to drop their emotional escort and resolve themselves into mere signals (Wundt, *Phys. Psychologie,* 847), may be illustrated by the gesture of pointing, which now merely indicates the object, but which originally was a stretching of the hand to grasp the object.

166. Because Intelligence is regarded as a particular function, men speak of insane patients not having their intelligence affected, even when the most serious defects of that intelligence are described. So long as a man can understand and answer correctly certain questions or express intelligibly certain desires, his intelligence is often said to be intact. But the extravagances and incoherences of speech and act which are observed in him are defects of intelligence; and to say this is "intact" is equivalent to saying that a man's

respiration is intact when he has only one sound lung, because he can still breathe with that. In acute mania there is abundant evidence of many intelligent processes, parts of the mechanism being still intact while others are disturbed.

167. All these contradictions are avoided when we recognise Intelligence as the abstract expression for very numerous concrete processes, and each intuition, image, or idea as the residual nervous adjustment of its particular organic process. The animal moving towards its food is determined by a particular nervous adjustment, which adjustment, in course of time, becomes capable of excitation by quite other stimuli, and even capable of being faintly excited without the appreciable excitation of the motor organs : it is then distinguished by a special name, and is called an intuition ; it has become an element of Intelligence.

CHAPTER XIII.

VOLITION.

168. Of the three elements of the Triple Process it is the Motor-impulse which is dominant in the Will. All the various forms of Affective and Intelligent excitation are but the preludes to Action. They may be obscure or conspicuous; they may escape consciousness, as in some forms of Reflex Action, or emerge in consciousness, and there throw Action itself into the twilight. That is to say, Feeling is divisible into feelings of excitation and feelings of operation; in the first we have little or no consciousness of the Motor-impulse; in the second we have little of the Stimulation and less of the Grouping. In movements of the limbs and trunk the feelings of operation are very conspicuous; they are less so in the delicate adjustments of the eye, ear, &c., and are only inductively recognisable in the still more delicate adjustments of Attention and Comprehension, which are also acts of the mind in more than a metaphorical sense. According to the exposition already given, the purest intellectual combinations involve motor-impulses (feelings of operation) quite as necessarily as the combination of muscles in manipulation. The feelings of Effort and Relief in seeking and finding our way through an obscure and tangled mass of ideas—the tentatives

of hypothesis and induction—are but fainter forms of the feelings in seeking and finding our way along a dark road or thick forest, checked by failure and enlightened by every successful step.

169. It is because the motor-feelings, whether those of muscular sensation and co-ordination or of logical grouping (feelings of operation), have not been sufficiently recognised, and because Experience has been too exclusively referred to data furnished by the special senses, that the advocates of the *à priori* doctrine have been able to show how much of our most highly prizèd Thought cannot be traced to sensation as its origin, but must be referred to the *intellectus ipse.* Touching these *à priori* conditions of Experience, I have already said that the biologist, in explaining organic phenomena, postulates an organism, with its modes of action, and these, if abstractedly considered, will stand for all that is valid in the *à priori* doctrine; but these it is the task of the psychologist to analyse.

170. It is true, but ambiguous, that there are many elements of Experience not wholly reducible to Sense. It is, however, quite gratuitous to conclude from this that these elements are to be referred to some Extra-organic agency. The ambiguity disappears if we extend the Sensible so as to embrace the whole Affective class of feelings; thus extended, and feelings of operation taking their rightful place, we find little difficulty in recognising the sensible origin even of abstract Relations. For, as already shown, Relations are given in their related Terms. That a relation, a connecting link, between two different sensibles is not given in either of the two, and can-

not be reproduced under the form of an image, is true. It is, however, given in both by the operation of Grouping, and this operation is felt ; and many such operations leaving *residua*, gradually condense themselves in intuitions, maxims, rules. One object is felt, another is felt as following the former—felt as larger or smaller than the former; and when such relations of sequence and magnitude come to be detached by Reflection, they are not only revivable when only one of the related Terms is present, but are revivable as abstractions of Causality and Magnitude. Once organised, these intuitions form part of the mental structure, and as such they determine the course of subsequent experience.

171. The conspicuous element in volition, as we have said, is that of Reflection ; namely, the discharge of a sensible excitation in a motor-impulse. And it is worthy of remark how this term Reflection has been chosen, unsuspectingly, to express the lowest and the highest psychical phenomena—now used for actions which have so markedly a physical mechanism that their psychical character is by most writers altogether denied, and now used for actions so conspicuously mental that their physical mechanism is even indignantly denied. To reflect upon the feelings which have just passed, is the excitation of one part of the Sensorium through the discharge of another part. To reflect the impression of a prick in the movement of the pricked limb, or in the movement of some other organ, is the excitation of one part of the central nerve-substance and the discharge from another. The reflex of a sensible impression in a motor-impulse is the elementary physiological process in all the

varied phenomena compendiously expressed by the phrase, "The organism is moved by sensation and guided by Intelligence."

172. The motor-impulses *arrest* no less than *excite* movements. All co-ordination and voluntary action depends on this suppression and redirection of discharge. Nay, even in the simplest reflexes there is always some suppression of impulses, which if simultaneously discharged would disturb or prevent the movement. Nevertheless, although the two forms of discharging and arresting impulse are universally present, we analytically separate them in the abstractions Incitation and Regulation.

173. All the impulses which determine action are personified in the term Volition; and out of these we select a particular class of ideal impulses—actions primarily determined by ideas—which we personify in the term Will. The terms are not used with absolute rigour, but the same need which there is for distinguishing between Intellect and Intelligence exists for distinguishing between Will and Volition. The Will is the highest expression of Choice, but in Volition too there is discernment, which is the main condition of choice.

174. The Motor apparatus involves the activity of motor feelings and intuitions, which are excited by sensations, by emotions, and by ideas. Obviously, therefore, the sphere embracing the whole of the motor-impulses must manifest phenomena of all degrees of complexity. The simplest degree is that of direct reflex, the most complex that of Will.

The Will is to Reflex action what Intuition is to Sensation. The muscles are innervated and nated in a definite way as the result of the connate or acquired disposition of the mechanism. Once established, this mechanism is set going by a particular sentient state, a particular nervous adjustment. This state may be a sensation or an intuition. In no case are we conscious of the mechanical disposition, but only of the sentient state which stimulates it. This consciousness in the case of a voluntary choice is that of a more or less vivid prevision of the end to be reached, never of the means by which the act is effected, though a feeling of effort precedes and a muscular sensation succeeds the act. This prevision of the end is the residual image of former sensations, and a sort of cerebral rehearsal of the consequence of the act. We see the end, not the means; we therefore will the end; and it is the established mechanism which executes the means of reaching that end.

175. Is not the reflex and automatic action effected in a similar way? There is the established mechanism, the feeling of innervation, the effort, and feeling of success. All that seems wanting is the cerebral rehearsal, the prevision of the end; an important difference, doubtless; but between the reflex and the voluntary action there must be recognised intermediate stages of habitual and involuntary actions, in which there is a prevision of the end, but it is so rapid, and the organism responds so unhesitatingly, that the difference from the simple reflex is reduced to a minimum. For example, when the eyelid drops at the approach of another person's finger, there is indubitably an intuition of the end which the dropping lid will effect, since until experience has organ- his intuition no lid will drop until the finger

actively touches it. Yet here the response is so rapid and so unhesitating that we are said to wink involuntarily. The intuition must excite the mechanism; there is no opening for control.

176. How the sensory stimulation originates the co-ordination, and having established this definite pathway leaves residua which become intuitions having the motive force of sensations, is recognisable in the accommodation of the eye to distances or the adaptation of the hand in various manipulations. The pianoforte-player has painfully to acquire these motor intuitions, learning step by step how to adjust certain muscles in response to certain visual or auditory impressions. Each adaptation is at first tentative, guided by a conscious prevision of the end to be reached, the note to be struck. After many and many repetitions the successful adjustments are registered and the sight of a printed bar of music, or the sound of notes, rouses the motor intuition, and the fingers obey it. But however obscure his consciousness of the intuition, its presence is proved by the facts that until experience had furnished it no sight of the crotchets would have rightly moved his muscles; and after experience has furnished it, a sudden diversion of his attention (the irruption of different mental states) will arrest the playing.

177. The three sentient spheres, affective, intelligent, and volitional, although inextricably blended in reality, are easily detached in theory and considered separately, according to the predominance of one of the three stages of the Triple Process. In another aspect also they have a sort of independence, for each may be stimulated idiopathically and sympathi-

cally.* This difference of stimulation has already been indicated, and may here be more explicitly set forth. Blindness is idiopathic when caused by a lesion or direct disturbance of the optic apparatus; it is sympathic when caused by worms in the intestine, or lesion of the brain. A sensation is idiopathic when caused by the direct stimulation of its special organ, sympathic when arising by association with some other sensation in a different organ, or with some emotion or idea. When one idea suggests another, one word recalls a sentence, or one conception carries a conclusion, the excitation is cerebral and idiopathic—delirium, dreams, reveries, trains of abstract thought, are illustrations; but when the idea arises in virtue of its connection with some sense-feeling or some systemic feeling, and not in virtue of its connection with some preceding idea, the excitation is sympathic.

178. It is to the sympathic excitations that we must mainly ascribe the important phenomenon of Spontaneity. The idiopathic excitations have more the character of mechanical necessity. Spontaneity by no means excludes causation of an equally necessary kind; but because the causes are obscure, complex, variable, we need a term to distinguish them from the better-known, simpler, and less-variable idiopathic excitations. If I withdraw my hand suddenly on its contact with a hot body, the action is idiopathic, and is called reflex. If I withdraw it on hearing that the body it approaches is hot, or because some one tells me to withdraw it, the action is sympathic, and is called spontaneous; for being due to some indirect

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* I use this term rather than sympathetically, to avoid ambiguity.

excitation, it may be varied by another and controlled by another.

179. The independence due to idiopathic excitation and to the different modes of combination of neural units which characterise the different functions and faculties—which again depends mainly on the different modes of stimulation through the several organs—explains not only the marked variations in individual minds, and of the same individual at different epochs, but also the exaggeration or defect of certain functions and faculties in mental disease. Although the loss of sight is really a considerable modification of the mental powers, we know that it leaves so much intact that few consider the importance of the defect. So long as a man can rationally employ his other senses, and to some extent supplement by them the loss of sight, we still justly regard him as in possession of his powers. It is so when instead of absolute loss of sight he has some disturbance of the optic apparatus which determines hallucinations of sight, by him clearly recognised as hallucinations. If in other respects his Intelligence is sufficiently normal, so that not only can he understand what is said to him and guide his actions correctly by his other senses, but he can also understand that the visual sensations are not due to their normal objective causes, no one considers him insane. It is a question of definition. If Insanity means Mental Malady in general, and if any abnormal state of the Sentient Mechanism is a malady of more or less importance, then we must say that hallucination, being an abnormal state, belongs to the class of mental maladies. But since no one speaks of a cold in the head or a fit of indigestion as disease, though

both may develop into diseases, so no one speaks of slight and passing abnormal states of the sentient mechanism as insanity. There is no doubt disease when a man hears voices or sees objects which those around him are able to declare not to be present; although he has the same feelings that these voices and objects would excite were they acting on his organs, he can understand from the testimony of his other senses and of his friends that there are not objective causes for these feelings; the disease is therefore slight and local;* it becomes serious when it spreads, and when he can no longer control his judgments by the other senses, but believes that there are objective causes present for the voices he hears and the objects he sees: he is then insane.

180. Instead of hallucinations of the Senses there may be perfect healthiness of these, and maladies of the viscera which produce their hallucinations. So long as the unhappy patient merely feels these

* Spinoza at one period of his life was troubled with subjective visions, and he expressly mentions that he succeeded in driving them away only by *fixing* his gaze on some definite external object, such as a book, though when he allowed his eye to wander *passively* they reappeared.† This is instructive as pointing to the difference between the *adaptation* of the eye to grasp, as it were, the object, and the passive yielding to the sensorial tremors centrally excited. The celebrated oculist Graefe had a patient who fourteen years before had lost both eyes from inflammation. The eyeballs were atrophied and contained chalky concretions which could be felt externally. This patient was troubled with sensations of light and colour which after any violent mental agitation passed into hallucinations, first of the heads of animals and finally of familiar human faces. These became so terrifying to the blind old man that Graefe, believing their origin to be an irritation of the retina, divided both optic nerves. The result was not only to free the patient from his hallucinations, but also, at least during the first weeks after the operation, from all subjective sensations of light and colour.‡

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† SPINOZA: *Opera Posthuma*, 472. *Epist.* xxx.

‡ Quoted by MAYER: *Die Sinnestäuschungen und Hallucinationen*, 1869, p. 113.

abnormal effects and understands that they are due to some visceral disturbance, he is not insane; but when he imagines that these feelings are caused by a serpent inside him, by electricity sent through him from unseen batteries, by poisons secretly administered in his food, and so on, he is insane. Yet even then, when the disease has involved the understanding, and when so much of the patient's thinking is abnormal, irrational, there is still a vast amount of normal activity of the Intelligence. The perceptions and ordinary judgments, the reasoning on other topics, and the conduct, are such as they were before this disease appeared. The great change is in the Emotive sphere. It is this which is always disturbed in insanity, because it is this which is the deepest, broadest agency in the organism. There may be Rationality and Perception, with pronounced disturbance of the Emotions. No errors are committed in the interpretation of perceptions, nor in the interpretation of words and other signs, only in the interpretation of the systemic feelings. The conduct is consistent and rational in all respects except in respect to these. The man who believes that a wolf is eating his inside, or that he is immensely rich, beloved of princesses, &c., knows perfectly well that the dog he sees is not a wolf, that the washerwoman is not a princess, and that the change for a sovereign must be twenty shillings.

181. Many an impulsive madman is perfectly conscious of all that he is doing, and of the criminal nature of his act, but he is also conscious of being impelled to act so. He is *conscius sui* but not *compos sui.* Those writers who identify insanity with irrationality would deny that such a man was insane;

they would class his actions with those of the angry man—anger having been defined *mania sine delirio*. But delirium of ideas is not essential to insanity; and only the traditional tendency of identifying Mind with Ideation is the reason why, outside the circle of students of mental pathology, no one considers a patient to be insane unless his language is incoherent and the ideas he expresses are absurd. That a man may be insane and talk rationally, nay, even act rationally where his abnormal impulses do not come into play,* is not only evident to every one who visits an asylum, but is known to be the case in the vast majority of insane patients. On the other hand, a man may manifest extreme incoherence without being insane—as in the delirium of fever or intoxication.

182. Insanity is manifested in each of the three spheres, Affective, Intelligent, and Impulsive: in perversions and exaggerations of the feelings, incongruities and incoherences of ideas, and in defective co-ordination and violent actions. All three are of course involved in every case, but the dominant symptoms appear in one or the other. This is so because of the solidarity of all organic processes. Therefore while we recognise the *in*dependence of certain Modes of response, the particularity of functions and faculties, we must always bear in mind their intimate *inter*dependence. The intellectual life is the outcome of the affective; it is only a mode of representation of the feelings, which afterwards becomes their *substitute*, and is thus a guide of actions: but it is a guide only as a torch which lights the

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* Griesinger, *ut supra*, 140.

way. The difference between an idea and a volition is that between a sign and the thing signified. If the idea excites the motor-impulse, it is accompanied by the feeling of effort—which may be either that of Attention or of Action.

CHAPTER XIV.

HYPOTHESES OF LOCALISATION.

183. After this survey of the three Modes of response we may consider the hypotheses which localise them in different parts of the organism. Sensation, Thought, and Volition are generally localised in the cerebral hemispheres; sometimes in particular convolutions of those hemispheres; and sometimes even in particular cells. Other writers assign Sensation to the optic thalamus, Thought to the cerebrum, and Motor Impulse to the corpus striatum. All such localisations, unless interpreted as shorthand expressions for the action of the whole organism with special reference to these organs, seem to me essentially unphysiological; and even with this important correction they are wholly hypothetical. We regard the Eye as the organ of Sight, the Stomach as the organ of Digestion, meaning only that these organs play a special and essential part in the functions of Sight and Digestion; but unless we supplement the Eye with the Sensorium, and the Stomach with the living organism, neither of these functions is possible. Now when in like manner Thought is assigned to the cerebral hemispheres, two oversights seem to me to be made: First, that of restricting a general function to a particular organ, restricting Thought to Concep-

tion, Intelligence to the Logic of Signs; secondly, that of imagining that the particular organ in question, unlike all other organs, is capable of dispensing with the co-operation of the Sensorium. The Eye is incompetent to see by itself; it is not accepted as the seat of vision. But the hemispheres are supposed to be the seat of sensation and thought; and these are said to be its '*specific energies.*' The hypothesis is manifestly at fault with regard to Sensation, since there is ample evidence of Sensation in animals from whom the hemispheres have been removed; and with regard to Thought, the hypothesis is only tenable on the understanding that Thought does not mean the general logical process, the co-ordination of feelings, but a particular process co-ordinating certain special feelings.

184. "Physiology," says Griesinger, "sees in psychical acts functions of a definite organ, and even endeavours to deduce them from the structure of that organ. True, indeed, that experiment proves that if the psychical faculties, in the widest sense, are bound up with the entire nervous system, the seat of intelligence and the affective faculties is in the brain, and even in certain definite parts of the brain" (*Maladies Mentales,* p. 2). Now I ask the reader to reflect for a moment on the great complexity of the elements which go to form Intelligence and the Affective Faculties, drawn as these are from widely-dispersed excitations in the organism, and then consider the irrationality of assigning them to a single organ, or portion of an organ, as its *specific energies.* It is possible, nay even probable, though very far from proven, that certain neural processes in the brain are

necessary for the integration of the widely distributed organic processes which enter into Intelligence and Emotion, that, so to speak, these neural processes may be the mainsprings which set the mechanism going in one dependent series of actions; but on that account to consider Intelligence and Emotion as the specific energies of cerebral substance is equivalent to calling time-indication the specific energy of a watch-spring. If we are to call the brain the organ of the mind, it can only be in the same way that we call the eye the organ of sight; that is to say, it is the most conspicuous part of the complex apparatus whose functions and faculties involve the convergent activity of all the parts.

This is the first correction. It is important, because it ceases to limit the Sensorium to the brain, and places the hemispheres in a position similar to that of the retina, namely, that of *a peripheral organ of excitation* to which the Sensorium responds. I hold that the cerebral processes are no more the physical substrata of mental processes, than the retinal processes are the physical substrata of vision, but only initial stages of such processes. And the correction is confirmed by the fact that the comparison of the brain to the eye, and of Mind to Vision, is but a partial analogy. The eye, or optical apparatus, is the special organ of Vision in this sense, that no other organ yields any of the feelings thus classed. If we see through the eye, and only through the eye, this is a good reason for calling it the organ of vision. But the same cannot be said with regard to the brain. The mental functions and faculties are not thus restricted. Mind is the sum of all the psychical phenomena, it is constituted by all the sensations, systemic and special, all the appetites, desires, impulses, and all the logical processes which co-ordinate and combine these. Being thus constituted, its organ must be the complex of organs on which those activities directly depend. This, which is evident *à priori*, is confirmed by experiment: removal of the brain, in spite of the serious disturbance of the organism which results, is not the destruction of all these constituents. Nay, even if we follow a popular classification, and separate Mind, as equivalent to Intelligence, from Sensation, Emotion, and Volition, the same objection must be urged. And if we regard the brain simply as the supreme regulative centre, holding as it were the reins in its hand, we must still connect these reins with the horses, or they will effect no movements. Is vision a mental fact? if so, the Eye is a necessary condition. Shall we say that the purely mental side of this fact is due solely to the brain operating on the stimulations received through the eye? This will not help us. The separation is an artifice. The operation and the stimulation are stages of one process. And if the fact that there can be hallucinations of vision which are recognised by the patient to be abnormal states, seems to show that the Mind can preserve its normal rationality while one of its functions is abnormal, this only proves the composite nature of the Mind and of its organs.

185. The point just touched on may indeed be reasonably urged in favour of viewing the brain as the supreme centre through which alone such a combination of the other organs takes place, that while one is affected or disturbed, the unity of the rest is maintained, and the personal consciousness

which represents this unity is preserved, and is capable of reflecting on the affection or disturbance. All I mean to indicate is that the supreme centre can only by analysis be separated from all the rest of the organism, and that Mind is not the function of one organ, but of the organism.

186. Some German writers, adopting the hypothesis of specific energies of the nerves propounded by Bell and enforced by Müller, extend it to the Sensorium. As there are certain modifications of nerve substance which render the nerves capable of responding only in certain specific ways, however stimulated, if they respond at all—the retina responding to ethereal vibrations, to blows, or to blood pressure only by the sensation of light, the auditorius responding only by the sensation of sound—so, it is said, there is a certain modification of the central substance which has the specific property of transforming molecular movement into Sensation; another modification which transforms Sensation into Thought; a third which transforms Thought into Volition. There are thus, sensation-thought and will-substances (*Sinnsubstanz*, *Denksubstanz, and Willenssubstanz*).

187. There is no anatomical warrant for such an hypothesis, but we may nevertheless under a slight correction adopt it as a convenient mode of expression. The correction I propose is to replace these special *substances* by special *combinations* of neural units, all similar as units, and all combined according to the same general laws. The facts on which Bell and Müller rested the specific energies of nerves show that the organism has different modes of reaction in response to different stimulations. The facts

indicated in our chapter on the organisation of impressions show that frequent stimulation in one direction establishes a line of least resistance, which thereby excludes any other mode of response. That the central nerve tissue, assuming it to be even perfectly homogeneous, should thus differentiate into fixed and diverse forms of grouping, is an induction warranted by all we know of the differentiation of the ovum into the manifold tissues and organs of the adult. One particular grouping of cells and fibres will thus always tend to form itself under stimulations that are similar to those which have already determined such a grouping; and this, whether the origin of the stimulation be peripheral or central. Thus the nervous adjustment which causes palpitation of the heart may arise directly from stimulation of the vagus centre, or indirectly from a stimulation caused by indigestion, terror, joy, expectation, &c.; but if the vagus be paralysed, none of these remote causes takes effect, the proximate cause being inoperative. The same is true of the nervous adjustments of sensations, images, ideas. Each is a special response to a particular grouping of neural units.

188. Under this connection 'sense-substance' does not mean a special tissue but a particular grouping of neural elements primarily and idiopathically determined by the contact of a stimulus, and secondarily or sympathically by the stimulation of some other groups formerly associated with it. In both cases it has a characteristic energy of reaction. It is this energy which most markedly distinguishes it from its reinstatement under the form of Imagination. The image is the reproduced sensation, resembling it in all

essential respects except in energy, and even this it will sometimes acquire—in hallucination. We conclude therefore that the reproduction occupies the same neural grouping as the sensation which produced it; or nearly the same. And if, in common with all psychologists, we admit that images belong to Thought, that Memory is a reinstatement of Sensation under fainter energy, and that Judgment is a combination of images and sensations, we have no alternative but to admit that 'Thought-substance' is the same as 'Sense-substance;' unless we suppose a special tissue for the formation of intuitions and conceptions, or a special organ for the logical process. The latter is not tenable when we learn how indispensable is the logical process in all psychical phenomena. The former is doubtful when we learn the genesis of intuitions and conceptions, and their origin in sensation.

189. Although I conceive the most consistent hypothesis to be that of one substance with various combinations of its units, and various energies in the reactions of these groups, the results of one *sensorial surface* stimulated from a variety of *sensitive surfaces*, there is also another hypothesis having much in its favour, which I will now state. We may suppose that Ideation—including images, conceptions, and intuitions—has a separate seat from Sensation, intimately connected with it, and repeating its processes very much as echoes reverberate sounds, with the further power of idiopathic excitation whereby one ideal state combines with and calls up another without the intervention of sensations (as if echoes blended and awakened echoes of *other* sounds). The difference may lie either in the tissues of the two,

or in their different connections with the rest of the organism. The anatomical evidence, at present, is against the supposition of different tissues; but the difference of connection in cerebral and sub-cerebral centres is conspicuous.

190. Consider: The whole of that large portion of the neural axis which Germans call the *Brain-stem*—consisting of the spinal cord, medulla oblongata, and cerebral ganglia, with its thirty-one pairs of spinal nerves and nine pairs of cranial nerves—is the nervous *trunk* innervating the whole body, and sensitive to impressions on the body. It is one great reflex arc of sensitive and motor processes. Rising above it is the *corona* (what the Germans call the *Brain-mantle* because it *covers* the other parts) consisting of the cerebral and cerebellar hemispheres. From this no nerve directly issues (see *Physical Basis of Mind*, p. 148), yet its structure, both as regards the grey and the white substances, is in all essential points the same as that of the trunk; it also has the properties of excitation and reflexion; but its excitations are never directly those coming from the *sensitive surfaces*, but always indirectly and through the *sensorial surface*—or, to speak less ambiguously, the spinal and subcerebral substance must be stimulated before the cerebral and cerebellar substance can be reached (due allowance being made for its sensorial surface which is idiopathically excited). We may therefore consider the *corona*, or supreme centre, as a *superposed reflex arc*. It has its stimulations and reflex discharges of the same order as those in the lower arc, but sympathically receives excitations from, and discharges reflexes on, the lower arc. The pro-

cesses when idiopathic run their course for some way without powerfully affecting the lower arc—as when thoughts chase each other, and never issue in determinate movements, though (as will hereafter be shown) they always discharge finally on the lower arc, and even our most abstract thinking has its correspondent movements in the motor apparatus of speech.

191. I have before compared the cerebrum to the coachman holding the reins and guiding the team. Although there is a constant stimulation coming from the movements of the horses, and from anticipations of such movements, the coachman has a will of his own, a choice of directions, and many suggestions which arise in his mind are never translated into actual pressures on the reins. The illustration is manifestly at fault in one point, and that was why I chose it in order to bring into view the latent fallacy of the popular notion. The coachman is really a separate agent, only temporarily part and parcel of the mechanism. He has his functions apart from the coach; and can use his functions in very different circumstances. Not so the superior reflex arc. That is both anatomically and physiologically an inseparable portion of the mechanism. Its position and connections may give it a speciality of function not possessed by the lower arc, but its reflexes are from first to last dependent on this lower arc. The crown is so far less independent than the trunk, that whereas the trunk is perfectly able to perform all its functions without the crown, the crown is absolutely powerless without the trunk. Normally they both act in concert. In any one sensation very complex factors

may be recognised, involving both crown and trunk. There is a sensitive surface stimulated, and sensorial reaction as logical grouping—there is Interest, Attention, Recognition, Localisation, &c., all which operations are usually considered to belong exclusively to the sphere of Thought. In any one thought, again, are condensed the operations usually assigned to the sphere of Sense.

192. The solidarity of the nervous system and the community of psychical phenomena being fundamental facts, the question of localisation scarcely admits of a final decision. The utmost that seems ascertainable is the discovery of the particular organic processes which determine particular phenomena, in co-operation with the general processes common to all. Thus in any particular sensation or class of sensations we may specify the visceral or special organ which by its action determines the phenomenon to be this mode of response and not another. In any particular conception we may specify the perceptions it integrates, and the verbal process which gives the integration body and form as a symbol; these perceptions and this verbal process being in turn reducible to their organic conditions. Until the whole region has been thus explored any attempt at a map must be hopeless. When we have a detailed analysis before us we may proceed to construct our synthesis.

193. Meanwhile the provisional hypothesis which seems to me most in accordance with present knowledge is that all psychical phenomena are the various forms of sensorial reaction, that is to say, various combinations of neural units in groups and connected groups; and that the Sensorium is only an abstract

expression representing the unity of the organism, which is itself a complex of manifold elements. Without denying the advantages of the hypotheses which assign different classes of phenomena to different centres, or organs, I think the hypothesis of different states of the one centre more consistent with all the facts.

194. Let us consider some of the hypotheses. Dr. Michéa, who is a spiritualist, thus describes the supposed course of a perception: "There is first the impression direct or indirect of a body on the sense-organ—this is *sensation*. Next there is the transmission of this impression to the brain by the cerebral nerves or by the spinal nerves." (Is it the impression, or the sensation, which is transmitted?) "Then takes place the reception by the brain, the act in virtue of which the mind has *consciousness of the transmitted impression*, *refers* it to the *actual existence of a body which corresponds* to it in the external world, and *believes spontaneously in the reality* of this body—that is to say, *the perception*" (*Du Délire des Sensations*, 1846, p. 1.) Criticism would be wasted on such writing as this; and yet such writing is very abundant.

195. Far more rational is the hypothesis of a Sense-centre (*Sinnhirn*) constituted by the (hypothetical) endings of the nerves of special sense at the basis of the cerebrum; and a Thought-centre (*Vorstellungshirn*) constituted by the cerebral convolutions. In this way the senses furnish the materials, and the cerebrum operates on them, converting sensations into perceptions and perceptions into conceptions. Now although I recognise the utility of the analytical distinction between operation and the materials operated on, I do not understand it to imply a real

distinction, with corresponding organs; any more than the analytical distinction of laws of motion and moving bodies which enables us to consider each apart, proves the existence of a separate locus for the laws. The elements of all psychical phenomena are the sensorial states produced by impressions and motor impulses either as sense feelings and motor feelings, or their images and intuitions. The various combinations of these into perceptions and conceptions may be theoretically detached, as the laws of motion are; but the neural processes which connect and combine two feelings cannot be really detached from the neural processes which constitute the feelings, any more than a relation can be really detached from its related terms. It is true, and important, that there is a variation of neural process in the primary and secondary states called sensation and image; there must be a variation since there is a manifest difference in the feelings. But the question is, whether this is an *intensive* or an *extensive* variation—I mean whether it is due to degrees of energy in the excitation, or to responses in different organs, similar neural groups in different portions of the nervous system.

196. Many writers regard the whole of the ingoing nerves as a sort of keyboard or *sensitive* surface, the strings of which terminate in the cerebral convolutions, or *sensorial* surface, where they form a kind of tesselated mosaic of tones (sentient impressions), each nerve or each fibre having its particular note. In another part of the convolutions there is an analogous keyboard, the strings of which terminate in the muscles, which thus represent the motor side of

sentient phenomena. In the residua of the first there are the central elements of impression; in the residua of the second there are the central elements of volition. Sense feelings, and their intuitions, images, conceptions, and Motor feelings with their intuitions and images, are thus localised in this double keyboard. The impressions on the *sensitive* surfaces, as each key is struck, pass from the periphery upwards through the optic thalami; the reflected impressions from the *sensorial* surface, as each key is struck, pass from the centre downwards through the corpora striata. The upward passage terminates in sensation, the downward in movement.* Some writers believe that the impression is a purely physical process until it reaches the optic thalamus, when it suddenly changes its quality and becomes a sensation; and, in an ascending evolution of spirituality, it becomes an image or idea on reaching the central termination in the cerebral convolution. How a neural process in the spinal centres can thus suddenly change its character on reaching the optic thalamus which is formed of precisely similar substance, and again change its character on reaching the cerebral cortex, which is also formed of similar substance, no one ventures to explain. The occult quality of a 'specific energy' is invoked.

197. Both the hypothesis which places Sensation exclusively in the cerebrum and that which places it in the optic thalamus (and corpora quadrigemina), reserving Perception for the cerebrum, are in flagrant contradiction to certain unquestionable facts, showing as these do, that the destruction of these organs, although producing serious disturbance in the sentient functions,

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* GOLTZ: *Neurology*, p. 85.

is not followed by a complete destruction of the functions. Not, however, to insist on this point for the present, let us pursue our consideration of the hypothesis. The impressions having been felt, the cerebral surface having had its tesselated elements grouped into perceptions, an image of each object is deposited in each group, and emerges in consciousness whenever the group is again excited. How far the metaphorical language generally in use on this subject is understood to be merely figurative one cannot say. No doubt many writers and readers would scout the notion of images being actually *retained* in the brain-cells, and would declare they only mean that the brain-cells, once affected in a certain way, are so modified that they afterwards always react in that way. Meanwhile there is general agreement as to the retention of the results of impression; and the six hundred millions of cells (which is the estimate Meynert gives) are invoked for the immense variety of impressions which can be thus retained. The fact of former impressions being revived in Memory is undisputed. If we explain this fact by the hypothesis of retention in cerebral cells which are the central terminations of the sensitive keyboard, the question arises: Why dissociate thus the central termination from the rest of the vibrating string? The process in the nerve fibre, spinal centre, and subcerebral centre, which is admitted to be the necessary condition of a sentient tremor, and only completed by the cerebral reaction, cannot be set aside as no longer belonging to the mechanism of sensation, any more than the string can be set aside, and the sounding board credited with the entire production of the note. Would it not be more rational to conclude that every co-operant condition in the production of a sensation is also active in the reproduction of that sensation, and with lowered energy in the reinstatement of that sensation under the form of an image ? The explanation then of any variation between sensations and images or between images and ideas would not turn on a difference of seat, but on a difference in the neural units.

198. Several modern psychologists have maintained that sensations and images occupy precisely the same neural tracts ; the remembrance of a sensation being simply the re-excitation of its original tract under a fainter form. Prof. Bain has powerfully argued this point and made great use of it.* Accepting the general statement, I must however qualify it in order to meet the objections which may be urged from the psychological and the physiological side. On the first it is evident that images and ideas are not altogether exact reproductions of the sensations nor of the

* "The shock remaining in the ear and in the brain after the sound of thunder must pass through the same circles and operate in the same way as during the actual sound. We can have no reason for believing that in this self-sustaining condition the impression changes its seat or passes into some new circles that have the special property of retaining it. Every part actuated *after* the shock must have been actuated *by* the shock, only more powerfully. With this single difference of intensity the mode of existence of a sensation persisting after the fact is essentially the same as its mode of existence during the fact. . . . Now if this be the case with impressions *persisting* when the cause has ceased, what view are we to adopt concerning impressions *reproduced* by mental causes alone, or without the aid of the original, as in ordinary recollection ? What is the manner of occupation of the brain with a resuscitated feeling of resistance, a smell or a sound ? There is only one answer that seems admissible. The renewed feeling occupies the very same parts and in the same manner as the original feeling, and no other parts, nor in any other assignable manner." † The whole chapter should be studied.

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† BAIN : *The Senses and the Intellect*, p. 338.

perceptions; in some respects there is not only difference of feeling but decided contradiction in their modes of operation, resulting from the grouping process of images and ideas being somewhat different from that of perceptions. If image and sensation occupied the same parts and in the same manner, except in degree of energy, then whatever was true of the one must be true of the other, and nothing could be true of an image that was not true of the sensation unless referable to diminished energy. But I have pointed out that there are notable exceptions to this reciprocity. In fact, whereas sensations of sight, touch, scent, hearing, &c., are severally the constituents out of which images and ideas are formed, the grouping of these into an image or idea is a secondary process of condensation, whereby all the constituents are lowered in energy, and some of them are merely nascent escorts *below the level.* In my idea of a bell the hardness and coldness of the metal are indeed implicit, but they need not be explicit; a very faint revival of its form and colour may accompany the more dominant revival of its sound. Now although all these sentient excitations were necessary constituents, yet if any one of them be dropped out of the idea there must obviously be some difference in the path occupied by the two. And if instead of the image of a bell we have the conception or verbal symbol representing all our experience of bells, there is here not simply a marked difference in the state of Feeling, there is the *substitution* of a verbal process for the processes of special sense. The word may symbolise, it does not reproduce, the sensations. The conception of gravitation is no image of two falling bodies nor the sensation of seeing one body move towards another. It is an abstraction wrested from all the sensible experiences and expressed by a verbal symbol. Sensible experiences were necessary to its existence as a symbol, but the symbol has been substituted for them, and the sensible experiences are now revived only by an effort.

199. Now turn to the physiological side. Although the integrity of a sense-organ is indispensable to the original production of a specific sensation, it is by no means indispensable to its reproduction under the form of an image. We cannot have the sensation of a coloured object without the agency of an optical apparatus; but this apparatus may be destroyed, and the image of the coloured object be retained in all its pristine vividness. In the dark we are all blind, so far as excitation of the optical organ is concerned; yet in the dark we have not only vivid images, but even images that approach the intensity of sensation. It is the same with the other senses. Poets have become blind and musicians deaf without any diminution in their pictorial and musical imagery. The stored-up experiences of early days still enrich them. I have been informed by a gentleman who lost the sight of both eyes in youth that he is still able to fish in any river with which he had been familiar before the accident. The images of each bend of the river, each bush and inequality of the bank, are present to him with surprising accuracy. One cannot therefore say in such cases that the images occupy the same parts and in the same manner as the sensations, since these are no longer all the original parts in existence. Nor will it suffice to say that although the eye and peripheral apparatus were destroyed, the optic nerve and its

central termination were preserved; this would remove sensation altogether from the peripheral portions of the organ to localise it in the centre, and would thus contradict the evidence which shows that the peripheral portions are necessary constituents; moreover it is met by the fact that not only have cases of complete atrophy of the optic nerve up to its disappearance in the centre been accompanied by the power of reviving visual images, but that these images have acquired the intensity of sensation. Prof. Bain attributes the reproduction of visual images after the loss of sight to the muscular feelings of the eye. And this indeed is a point worthy of notice, for the muscular movements of the eye undoubtedly form constituents in vision; but since muscular feelings cannot produce *colour*, and colours are reproduced after sight has been destroyed, the explanation is defective. We have still to ask, Where are the colour-producing elements?

200. From such facts it has been concluded that sensations no less than images are exclusively seated in the brain. But this conclusion must on other grounds be rejected. Let us, instead of placing sensations and images in two distinct though interdependent organs, try if we cannot reach a consistent interpretation on the supposition that these sentient states differ only as different sensorial responses to stimulations of different intensities. We begin with the postulate that the wave which passes from the sensitive surface A to the sensorial surface AB, say from the retina to that part of the cerebral convolutions where the optic tract has its terminus, is one continuous excitation of Sensibility, the energy of which will of course vary with the amount of molecular change in

this tract. A beam of light striking on the retina will agitate the neural tract from A to AB. And since the molecular wave in a neural tract will pass from outwards inwards and from inwards outwards according to the point of stimulation, we understand how some other stimulus, besides the beam of light, can agitate this neural tract, and how on the theory of 'specific energies' (which is that of specific responses to specific excitations) every agitation of *this* tract will have more or less of the quality of a sensation of light. Not only will the wave pass from A to AB but from AB to A. That is to say, a stimulation of the central termination will in proportion to its energy agitate the whole tract; but although in certain abnormal conditions of excitability the level is so raised that a central stimulation has the intensity of a peripheral and the image flames into an hallucination, in normal states the intensity of a central stimulation is so much feebler than that of the peripheral that the difference of response known as image and sensation is explicable.

201. This is a quantitative factor. Another is the qualitative variation which depends on the escort of nascent excitations accompanying the sensation—the extent and energy of the central group with which the optical excitation blends. This is a purely sensorial factor. The elements of the sensitive surface are all distinct and independent; they only become united in the mosaic of the sensorial surface, and here there is no absolute independence, one element being inextricably linked with another. In illustration of this interdependence I have already (see *Physical Basis of Mind*, p. 284) imagined a connected group of

bells, all more or less agitated by the agitations of the connecting wire, but each giving a different and variable response according to special conditions of weight or attachment. Now we can understand how one or more bell handles and bell wires may be removed and still each bell preserve its particular tone, each sounding when some other bell sounds, and analogically we may understand how sensation and images can arise without peripheral stimulation; also, how images may be combined in ways impossible to the original sensations. The sensorial surface (the group of bells) has its internal stimulations, its own modes of operation; and as the changes of cerebral circulation keep up an incessant molecular change in its substance, the sensorium is for ever operating.

202. It has been urged in reference to Hallucination that the co-operation of the peripheral organ is necessary for sensuous evidence; and that the more central the stimulation the more the effect has a phantasmal quality. We do not believe in the objectivity of the sensation unless the sense organ itself is affected. This is not necessary. And the proof that it is not is seen in the hallucinations of those who have lost limbs or sense organs. Here intensity of stimulation (rise of level) is all that can be admitted. May we not also see the same condition in the familiar facts of normal sensations having the faintness of images, and even that of unconscious processes? When the tic-tac of the clock beats upon the tympanum and yet the student is unconscious of these sounds, or hears them faintly, when the trees and clouds impress the retina yet are faint and evanescent impressions, we attribute this to the sensorium being preoccupied by other and more

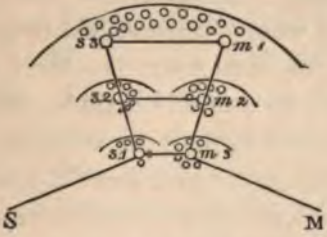
powerful excitations. The bell handle and bell wire have been agitated, but the bell is only faintly stirred, so faintly perhaps as not to sound. This is the obverse of the case when the bell is set swinging, but its oscillations only feebly agitate the wire and leave the handle at rest.

203. I conceive the cerebral no less than the retinal reaction to be only phases of the Neural Process which is the sensorial reaction, or sentient change; I cannot therefore agree with those who localise sensations, or images, in cerebral cells as if these constituted the specific quality of cerebral activity, apart from the general mechanism of which the cerebrum is a portion. Yet it has already been witnessed that the anatomical position and connections of the cerebrum and cerebellum are such as to imply some peculiarity of function. Let us see what this may possibly be.

204. The current Physiology has a diagrammatic scheme which is very simple and seductive. It is this: A sensory nerve-fibre terminates in a nerve-cell *S* in the posterior grey substance of the spinal cord. From *S* (see p. 431) a fibre passes to the anterior grey substance and there terminates in a motor cell *M*, which in turn sends forth a fibre to a muscle. The cells *S* and *M* thus represent the sensory and motor elements of the reflex action, which is the function of the spinal cord. Although the term sensory nerve is employed, it is not supposed to imply Sensibility; that is a property denied to the spinal substance, the processes in which are held to be purely physical.

205. I have on a former occasion pointed out the entirely fictitious nature of this anatomical exposition. This disposition of fibres and cells no eye has ever

seen (nor with present means *could* see). All we know is that one fibre passes into the cord, that another passes out of it, and that a movement is produced usually preceded by a sensation. The real disposition is, so far as we know, incompatible with this theoretic construction, yet it has been almost universally accepted because it helps the imagination to picture the course of a reflex process. But granting for a moment that the description is accurate, it needs completion by restoring the omitted facts. For the sake of simplicity—which is necessary in diagrams—everything has been left out except these three fibres and two cells, and the central tissue instead of being presented in its complexity is restricted to these. Here, as everywhere, simplicity is gained at the expense of reality, and the clearness of a diagram is substituted for the fulness of knowledge. And even if we suppose that only these fibres and cells are concerned in the neural process, we must still supplement the diagram by the consideration that *S* and *M* are not isolated independent substances, but are inseparable elements of a system which is affected throughout when they are excited. Thus it is that an impression on an ingoing nerve which enters the spinal cord is irradiated upwards and downwards. Thus it is that a pinch of the tail-tip is transmitted to the brain, and an excitation of the brain is transmitted to the tail. In its upward course the wave, after passing through the whole grey substance of the spinal cord, and sometimes causing movement in the trunk and limbs, though sometimes only causing movement in a particular group of muscles, reaches the Medulla Oblongata, which, although a continuation of the spinal cord, has somewhat different functions owing to its innervating other organs. From this the wave passes to the subcerebral ganglia, which complete the structures constituting the great reflex arc or brain stem. Only when reaching this stage is the process admitted to be psychical. Here sensation is understood to begin, and according to some writers here consciousness has its seat. But the most widely-accepted view is that the wave must pass onwards to the cerebral convolutions, and that there, in the excitation of its cells, it first becomes sensation, consciousness is first aroused.



The stimulus wave from the sensitive surface *S* is carried to the spinal centre *s*1, which may either transmit it directly to *m*3 and thus reach the muscle *M*; or transmit indirectly through *s*2, *m*2, in the subcerebral centre; or finally it may pass upwards through *s*1, *s*2, *s*3, and downwards through *m*1, *m*2, and *m*3. The reflex of *s*1, *m*3, is purely physical; that of *s*1, *s*2, *m*2, *m*3, is psycho-physical, there being a sentient state accompanying the mechanical process; while that of *s*1, *s*2, *s*3, *m*1, *m*2, *m*3, is a reflex accompanied by consciousness. The initial stage is a peripheral stimulation; but the same reflex may be excited by central stimulation. That is to say, the impulse may originate in *s*3, and pass through *m*1, *m*2, *m*3; or pass through *s*2, *m*2, *m*3. This is when an idea is said to originate a movement. Again, the stimulus may be some state of the subcerebral centres and pass from *s*2, *m*2, *m*3.

The hypothesis further postulates that the *impression* originating in *S* and terminating in *s*3 there becomes a *sensation*, and leaves behind it an *image* which will be reproduced whenever *s*3 is excited. The whole cerebral surface being thus a mosaic of cells which have their stored-up images—one class preserving the images of Sense and the other the images of Movement—the whole sensitive and motive apparatus is represented by this surface. Here is the ideal world of possible feeling and action. Uniting in one web all the various strands of sensitive and motive activity, the brain is the indispensable organ of spontaneous incitation, and of co-ordination. It stimulates and regulates all the organs.

206 This diagram represents some indisputable facts and much disputable inference. But to make it acceptable as the expression of a working hypothesis two corrections seem to me indispensable. First, the banishment of the illusory distinction between the physical, psycho-physical, and conscious reflexes. All reflexes are physical, all are psychical, according to the point of view in which they are regarded. The spinal centres have not a different tissue from that of the subcerebral centres; nor have these a different tissue from that of the cerebral convolutions. The properties and modes of action are the same in all three. Secondly, the distinction between Sensitive and Motor centres is analytical and topographical, not

physiological or psychological. There is not in a reflex action sensation as one event and motion as another; they are two aspects of one event, two stages of one process. If the ingoing nerve has a centripetal effect, and the outgoing nerve a centrifugal, the one carrying its excitation from the skin, the other carrying it to the muscles, vessels, and glands, we must remember that although we call the change in the Sensorium a Feeling and the change in the organs a Motion, the central and essential excitation is that of the centre, and all changes in the centre are excitations of its property, Sensibility. We call the cells or ganglia from which issue the outgoing nerves Motor, because topographical anatomy requires such nomenclature; but obviously it is not these cells, not these ganglia which have the movement; they are cells of the same nervous tissue as those which yield sensation.* The nerve centre is the theatre of changes, which are all of one kind.

207. And this leads to the third correction. The current hypothesis (in flagrant contradiction to observation and induction) postulates that the wave of excitation is only propagated in one direction along a nerve fibre, centripetal in the sensitive, centrifugal in the motor fibre. There is therefore only reflex action possible from a skin nerve to a muscle nerve. Now I need not pause to expound the experimental evidence which proves that nerves *can* conduct excitation in both directions (see *Physical Basis of Mind*, p. 279). It is enough to appeal to such familiar facts as that the

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* That slight differences in size and shape (were these constant) could determine such diametrically opposed properties as sensation and motion, is a supposition hard to accept.

feeling of grief may be produced by drawing down the corners of the mouth, or that of hilarity by drawing up the corners as in smiling, in hypnotised patients, to show that the feelings which have accompanied certain muscular movements will be excited when those movements are excited. Indeed the greater part of what are called the Motor feelings seem to me only explicable by this reversal of the wave along the path first followed. If excitation of *m*3 can arise when *m*2 is excited because of the organic connection, and *m*2 when *m*1 is excited, on what ground can we suppose that *m*1 will not excite *s*3? We postulate that *s*3 and *m*1 are both storehouses of impressions—say one retains the colour-image of an object, the other its motor-image—well, the colour-image may recall the motor, or the motor-image the colour: whether it is that the two images are blended in some centre common to both, or are merely linked together by a common pathway, their interaction is reciprocal.

208. From all this it is to be concluded that the sensorial excitation is far more complex in its conditions and its manifestations than the diagrammatic representation would suggest. We may be prepared therefore to find that clinical and experimental evidence is often at variance with the simplified presentation usually adopted. Could we believe that impressions left their images in the cerebral cells, and that each particular spot in the cerebral convolutions was the terminal and representative station of each particular impression and each muscular movement, our task would be easy. But we cannot believe this.

209. The existence of sensitive and motive centres in the spinal cord was a natural inference from the facts of reflex action, and received strong confirmation from experiment which assigned the first to the posterior half of the grey substance and the second to the anterior half. As these were traced up into the cranial extremity of the cord, where however the separation became less and less conspicuous, the supposition was almost inevitable that the subcerebral masses of grey substance also admitted of this division into sensitive and motive regions: with a bold disregard of the evidence some writers (Wundt) have declared the optic thalami to be the *sensorium commune* and the *corpora striata* the *motorium commune.* And pursuing this track of hypothesis, it was plausible to assume that a similar division would exist in the cerebral convolutions, since these *represented* in their mosaic all the sensitive and motive elements of the organism. Being the seat of sensation and volition, the cerebrum was credited with fibres which were the analogues of the ingoing and outgoing nerves, and with cells which were the receptacles of sense impressions and motor impulses. The cerebral reflexes indeed were not supposed to take place directly—from sensitive surface to muscle—but indirectly through the sensitive and motive mechanisms of the brain-trunk. They were, however, operations of the same order. Since the labours of Hitzig and Fritsch, Ferrier, Nothnagel, Carville and Duret, some physiologists have not hesitated to assign the motor region to the anterior lobes of the cerebrum (a localisation which must puzzle the phrenologists) and the sensitive to the posterior region; others have been

content with a distinction of convolutions, and others again with a distinction of motor and sensory cells (Kussmaul: *Störungen der Sprache*, 119).

210. I will not here enter on this still uncertain ground of anatomy. A new direction of research has been opened which promises to lead to important results; but as far as we know at present we can only say that particular spots of the cerebral mosaic are specially involved in particular activities of the organism. Without peril we may conclude that certain groupings of the neural elements are the necessary conditions of sensory phenomena, and certain other groupings are the conditions of motor phenomena; and as motion follows sensation, we may conclude that the motor groupings are determined by the sensory. Confining ourselves to the cerebral groupings, and viewing these from the psychological side, it is intelligible that one sensation or image calls up another; the sound of an object being the stimulus which excites the image of its colour and form, or excites the desire connected with it, it will also excite the motor impulse—all these being different groupings of sensorial reaction. Obviously the group which is constituted by $s1$, $s2$, $s3$, will differ in intensity and quality from that of $s1$, $s2$; and this again from $s1$. In the first there is the maximum—the full conscious sensation—of sensorial reaction. In the third there is the minimum of reaction—the simple reflex. That the same movement should result from $s1$, $m3$, as from $s1$, $s2$, $s3$, $m1$, $m2$, and $m3$ is intelligible when we reflect how one element in a complex feeling suffices to effect the action at other times resulting from the complex. We grasp at an object

in the same way when we know what the object is—when its sight calls up a series of registered experiences, and when it is entirely novel, calling up no such series. We cough in the same way whether the stimulus be an irritation in the throat, in the intestines, or an idea of calling some one's attention to us. But the idea of coughing is only a preliminary stage ($s3 — m1$) which may be carried no further. The agitation may descend in waves too feeble, or may meet at $m2$ or $m3$ with resistance so great that no movement results, only a contractile twitter of the muscles. This arrest of the propagation may also be due to the excitation of $s3—m1$ being reflected through other paths: the idea of coughing may excite the idea of calling some one else's attention, or of being impolite, &c. Twenty other ideas may be determined by it, and each of these struggles for a motor issue.

It is this complexity of excitation which gives the character of deliberation to volition, and enables the cerebrum to regulate the actions. It is this which justifies the popular assignment of Intelligence to the cerebrum.

PROBLEM IV.

THE SPHERE OF INTELLECT AND THE LOGIC OF SIGNS.

> "La méthode qui enseigne à suivre le vrai ordre et à dénombrer exactement toutes les circonstances de ce qu'on cherche, contient tout ce qui donne de la certitude aux règles de l'arithmétique."
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> DESCARTES : *Discours de la Méthode.*

> "Così parlar conviensi al vostro ingegno,
> Perocchè solo da sensato apprende
> Ciò che fa poscia d'intelletto degno."
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> DANTE : *Paradiso*, iv. 40.

THE SPHERE OF INTELLECT

AND

THE LOGIC OF SIGNS.

CHAPTER I.

THE PROBLEM STATED.

1. HAVING explored the sphere of Sense, we have now to pass into the sphere of Intellect.

What is to be understood by this term? Prof. Bain shall first answer: "In proportion," he says, "as a mental experience contains the facts named, Discrimination, Comparison, and Retentiveness, it is an Intellectual experience; and in proportion as it is wanting in these and shows itself in pleasure or pain, it is of the nature of Feeling." Further on he adds: "The exercise of Thought is greatly mixed up with Volition also, . . . indeed it is hardly possible for us to exist in one exclusive state. Still, in our explanations of things we often require to separate in statement what is not separated in fact." Sir W. Hamilton divides the phenomena of Consciousness into three primary genera—Cognition, Feeling, and Conation; but as there can be no Cognition which does not involve Feeling, no Feeling which does not involve the characteristic element of Cognition (discrimination), and no Conation which does not involve both, it is clear that the division is a purely analytical artifice.

This was apparent in our exposition of the Triple Process. In the sphere of Sense we recognised the operation of what are specially known as the intellectual powers—Memory, Judgment, the logical combination and permutation of sensible impressions. These when analytically detached are personified in an abstract expression, Intelligence, which becomes Intellect when the operations are those of the Logic of Signs.

2. The abstraction has two meanings. It is sometimes an expression of the function of logical grouping, and sometimes of the product of the function: sometimes Thinking as an operation, and sometimes Thought, *i. e.*, "the content of consciousness." Intelligence or Intellect is the Personality which condenses the perceptions and conceptions that reproduce and represent sensible affections, and which regulates conduct. It is the supreme psychical centre to which all affections converge, from which all impulses are directed. It is the light of the soul; the spiritual person. To it belongs the hegemony of the organism. Hence the plausibility of the physiological hypothesis which localises it in the brain.

3. If we are right in regarding the symbolised logic of Feeling as the Intellect, and the logical aspect of Volition as the Will, we can no longer adopt the notion of Intellect being an independent function, having its own independent organ, and therefore a new *addition* to Sense. Still less can we admit it to be an inherited product, which we bring with us full-statured on our entrance into the world. It is a product which is evolved in Experience—the summa-

tion of myriads of sentient states (in every one of which the function operates) and varying with the experiences, so that the Intelligence of the child is different from that of the adult, and the Intellect of a Goethe is different from that of a Kaffir on the one hand and of a Newton on the other. The grouping, guiding function is the same in all; the elements grouped and the guiding range are different.

4. Carrying with us the conclusions reached in the preceding Problem, we shall here have to show that thoughts differ from feelings only as modes, as representations and symbols differ from presentations and objects. But having shown the continuity and uniformity of sensible and ideal states as regards the neural processes which are their organic substrata, and thus excluded the hypothesis of separate organs for Thought and Feeling, we shall have to expound the operation of the Social Factor, the introduction of which is the real cause of the elevation of Animal Psychology into Human Psychology, the sensible into the ideal world, Knowledge into Science, Emotion into Sentiment, and Appetite into Morality.

5. It has already been intimated that Sense forms only one group of the organic activities comprised under the head of Feeling, even when this term is used in its antithesis to Thought. Intellect in like manner forms only one group of the logical operations. As Sense is habitually limited to the affections of the Five Senses and the perceptions which condense and reproduce these, so Intellect is habitually limited to the images and ideas which reproduce and represent sensations. A tacit reference is made to systemic sensations, *emotions*, appetites, &c., but the main

emphasis is thrown on the feelings which directly refer to the objective world. The reason is, that perceptions and ideas are more *intelligible* than other feelings; which is saying that they are more easily translated in words, the intellectual symbols. Hence the predominance assigned in most psychological works to the genesis of sensations and ideas, as if these were the chief mental phenomena. Hence also the common notion that mental maladies are only disturbances of the normal processes of sensation and ideation; and the difficulty of admitting that a man who talks rationally can be insane, arises because Insanity is conceived to be only a disease of the Intellect, and Intellect is conceived to be a function apart.

6. The biological Method enters on a much wider field, disclosing that among the activities of the organism those classed as *la vie affective* are more massive than those classed as *la vie intellectuelle.* Important as Sensation and Ideation are, they are less important than the Appetites, Instincts, Emotions, and Sentiments. It is these which constitute the larger part of the sentient activity. Ideas are moving forces only in proportion to their emotional values, or, physiologically expressed, to the intensity and extension of the innervation they excite.

Nevertheless, as before stated, sensations and ideas are more intelligible, and therefore may more profitably be studied first. Analysis of the affective operations reveals that in them also there is an interblending of sensible, logical, and motor processes; but these processes are more easily studied in sensation and ideation, and can be more readily ascribed to objective influence, and measured by objective standards.

CHAPTER II.

IMAGES.

7. WITH images the subjective side of mental phenomena becomes conspicuous; with sensations the objective side was conspicuous. In treating of Sensation we had repeatedly to touch on images, for although there are marked differences between sensations and images, yet the features of resemblance are unmistakable, and the organic conditions of production are essentially the same in both. This is a fundamental point, involving the whole question of continuity and uniformity in psychical phenomena.

The continuity of Sensation and After-sensation will not be disputed. The uniformity of the conditions of production in After-sensation and Recurring-sensation will not be disputed, since the recurring sensation has all the qualities of the secondary and primary states, and only differs from these in energy, which is a varying quality in them also. Between the sensation of a blue colour, the after-sensation, and the recurring sensation there is only this difference of energy, with the consequent difference of escort. The sensorial vibrations set going by an objective stimulus are continued after the stimulus has been withdrawn, and may be reproduced by a subjective stimulus; but throughout, the vibrations are the same in kind and in place, and have the same substrata.

Between the recurring sensation of a blue colour and the image of a blue colour there is indeed a difference of Signature, but the identity of the neural process in both is evident not only in the close resemblance of the two as feelings, but in the fact that while both are due to subjective stimulation, the image easily acquires the energy of the recurrent sensation, and sometimes passes into that of the primary sensation.

8. Let us glance at a few facts. Two preliminary points must be settled. First, the word Image must be understood as designating any recalled feeling, of whatever kind, which wants something of the Signature and energy of the feeling or after-feeling it recalls. It may be a sight, a sound, a taste, a touch, a pain, an effort, a terror, a word. Secondly, and as a consequence of this, and of its being a reinstatement, it must not be understood in its ordinary acceptation as a picture or copy of the primary feeling, still less a copy of the object which was the original stimulus. It is no more a copy of the feeling, than a boy running across the field is a copy of the boy who the day before rode across the field in a cart: it is a reinstatement of the feeling, with a somewhat different energy and escort.

9. Students of philosophy are familiar with the strange hypotheses which have been invented to explain the supposed fact of images being 'copies' of sensations and of objects. According to the luminous suggestion of Mr. Tylor, the widely-diffused belief of savages that all natural objects have souls which quit them to wander and enter into other objects, is at bottom the hypothesis of Democritus that objects throw off eidola (images) which enter by the portals

of Sense, and thus enable us to perceive objects. When this hypothesis was found to be untenable, it was transformed into that of objects *impressing* themselves on Sense as on a waxen tablet, or *reflecting* themselves as in a mirror: hence the familiar terms 'impression' and 'image.' A sort of chamber was imagined wherein these spectra were preserved, and whence the mind could draw them at will.

No one now entertains such views, though many still cling to the notion that the vivid impressions called sensations, and the faint impressions called images and ideas, are reactions of distinct organs; and in this sense images are understood to be copies of sensations—repetitions not of the original vibrations, but of similar vibrations in another part of the nervous system. Sensations are thus localised in the peripheral sense-organs; images and ideas in the cerebral convolutions. Not to discuss this point here, I will only say that the notion of 'copies' is not simply mistaken, but seriously misleading; and that we must understand images and ideas to mean reinstatements of feeling.

10. In what does the Signature of images differ from that of feelings? Look at a bright object, turn aside your eyes and think of that object, and however vivid may be the reinstatement of your feeling, the image will have an unmistakable Signature. Taste a fruit, and recall that taste,—although the recalled feeling is markedly different, it is only by its fainter energy and smaller escort that you distinguish it. The sight of a wolf in the forest has a greater energy and escort, together with a much more powerful effect on the organism, *than the image of* a wolf recalled in your study. Yet

this fainter feeling, with its different escort of nascent feelings, occupies the same primary tract; and if, instead of being gently stimulated by some passing thought or the mention of the name, this image be stimulated by some more agitating suggestion—the sound of a low growl, the rustling of the undergrowth, or the cry of 'wolf' from a bystander—it will then have the escort and much of the energy of the sensation.

Michéa tells of a friend who having taken repeatedly a drug which excited great disgust and often vomitings, could not for eighteen months afterwards hear the drug named without its reproducing the sensation of nausea which sometimes actually passed into vomiting.

11. Newton, Johannes Müller, and Hermann Meyer have recorded how, after intently thinking, with closed eyes, of some particular colour, the retina becomes as exhausted by the image as if it had been exposed to an objective stimulus of colour, so that on opening the eyes ocular spectra intercept the objective stimulus. Meyer after thinking of a silver stirrup saw, on opening his eyes, a spectral stirrup right before him; this lasted some seconds.* Here the image has passed into After-sensation; as in Hallucination it passes into Sensation.

12. Sensation and After-sensation have their origin

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* Quoted by FECHNER: *Psychophysik*, ii. 486. (The whole chapter should be studied.) MALEBRANCHE had noticed the fact. "Il arrive quelquefois dans les personnes qui ont les esprits animaux fort agités par des jeûnes, par des veilles, par quelque fièvre chaude ou par quelque passion violente, que ces esprits *remuent les fibres intérieures de leurs cerveaux avec autant de force que les objets extérieurs*; de sorte que ces personnes *sentent* ce qu'elles ne devraient qu'imaginer." *Recherche de la Vérité*, II. chap. i.

in an objective stimulus; the Image has its stimulation from within. Hence it is impossible, while we are looking at or touching an object, to have the peculiar mode of feeling known as the image of that object, although under abnormal conditions it is possible to have the peculiar feeling when in truth there is no corresponding object acting on the senses. The sensations and after-sensations are unalterable by any effort. The images are to a great extent facultative, not indeed in themselves but in their order of combination. I see my friend dressed in black, seated on the sofa, and reading a book; all these sensations are forced upon me, I cannot see him otherwise; but while my eyes rest upon him I can imagine the dark clothing changed to gayest costume, the sofa replaced by a river-bank, the book replaced by a fishing-rod; such images will be fitful and passing rapidly into others, while the sensations will persist unchanged. These different feelings have different origins—peripheral excitation in the one, and central excitation in the other. So marked is this difference that it has very plausibly suggested the distinction of sensual and mental fields, with a corresponding physiological distinction of organs. I do not see in such facts the evidence of a struggle between two organs, but only evidence of an alternation of attitude, an oscillation of consciousness (as expounded in Prob. II. v.) For the present, however, I wish simply to record the facts. Müller remarks significantly that although subjective sensations were easily produced in him by internal causes, he had never been able by an effort of will to banish one colour and replace it by another (*Ueber die phantastischen Gesichtserscheinungen*, §147). Yet nothing is easier by an effort of the will than to banish one image, and replace it by another. Nay, images are incessantly fluctuating in spite of our efforts to retain them—another point of contrast with sensations; the reason being that images, arising from central excitation, are necessarily open to a variety of stimulations, whereas sensations arising from peripheral excitation are only changed with changes in the objects. The after-sensation, when not of such energy as to obtrude itself on notice, is only felt by us when we exclude other more powerful stimulations. We must close the eyes, and then in the dark visual field we observe the lingering forms and colours. We cannot close our ears, but we can abstract our attention from all other sound-sensations and hear the subsiding tremors. In every case we localise the feeling in the peripheral sense-organ. It is otherwise in attending to images. We do not in trying to recall the image of a friend fix our attention on the visual field; in trying to recall his voice we do not find ourselves occupied with our ears. We lay hold of every suggestion which presents itself as having an associative link—the places where we last saw the friend, the persons with whom he was, the words he uttered, and so on. Gradually the image gains distinctness; but during the whole effort there is a consciousness of the struggle taking place first in the head, and slowly and finally in the organ of sense.

It is an interesting fact, that with persons in whom images easily acquire the energy of sensations, the feeling of effort is always localised in the sense-organ rather than in the head; whereas with those persons in whom images have less energy, and are less easily recalled, the effort is more felt in the head. Very familiar images, *i.e.*, those constantly excited, are felt in the sense-organ from the first.

13. Sensations and images have significance for us in reference to conduct, and therefore these habitually attract attention; but after-sensation is only a psychological curiosity. I cannot agree with some modern writers who see in it the explanation of Memory and Imagination. Imagination is the production of images, and images we have seen to be states of feeling which are in some respects unlike after-sensation and more like the primary sensations; the image of an object is a fuller and more accurate Representation of the sensation produced by the object, than the after-sensation is. For one thing it includes the three dimensions of space, whereas after-sensation only includes two dimensions. It also has an escort which more or less accompanies the sensation, so that with the image there is revived a portion of the general landscape. Fechner observes that when he *looks* at his study with open eyes, or *thinks* of it with closed eyes, or in other places, the objects seen and imaged preserve the same relative positions; whereas when he produces the after-sensations (ocular spectra) of these objects, they all appear on one plane.

14. It thus appears that Imagination is not the same as After-sensation; and indeed the two differ in their conditions of production. Purkinje first remarked that the after-sensation persists longer when the nerves are irritable from weakness and anæmia, vanishing the more rapidly in proportion to the state of vital energy; whereas images are the more vivid when the *brain* is over-excited by alcohol, narcotics,

fevers, &c. (PURKINJE: *Beiträge zum subjectiven Sehen*, p. 166). Johannes Müller noticed that his after-sensations acquired a surprising vividness when he had been long fasting, but he never observed them after he had taken wine. Mr. Spencer attributes the persistence of after-sensation to debility, and says that when he was twenty he was unable to detect the phenomenon in himself, but was told by his father that he would do so as he grew older. "I now see them distinctly; and moreover I observe that they are most distinct at times of least vigour" (*Psychology*, I. 112). Nor is the fact of fasting monks and saints having had visions of a highly imaginative character at variance with this; for such visions are not normal activities of Imagination, but abnormal activities—Hallucinations.

15. The after-sensation is most vivid at first and gradually fades (subject indeed to resurgent energy), whereas the image begins indistinctly and gradually acquires vividness. A peculiarity of the visual phenomena is that the after-sensation of colour rapidly passes into its complementary colours, so that before the tremors finally subside a great variety of colours has appeared. A sound passes gradually into silence with no other perceptible change in its quality: the note originally struck is the note heard in the "dying fall." It is the same with a touch, a scent, a flavour.

16. It has been said that images are unlike sensations in being colourless and toneless. But the statement seems to me inexact. Great differences may be admitted in individual cases, but in all cases the images will reproduce, however faintly, the tones and

colours of the sensations. Call up the image of slices of hard-boiled eggs on spinach, and you will observe that the colours are all reproduced, and that the longer the image is sustained the more vividly they emerge—the yellow yolk detaches itself from the pearly white, then the yolk itself is seen to be streaked with faint white, while the iron-grey membrane also begins to appear; the spinach is from the first decidedly green. Think of a familiar sound—the dog's bark, the friend's voice—or mentally hum a tune, and you will have no doubt about the reproduction of tone. The reproduction of pain is fainter, yet strong enough to show differences corresponding to those between headache and toothache, for example, or cholic and rheumatism. Generally we may say that in proportion to the energy of the neural process requisite for sensation, is the feebleness of the corresponding image. The visual sensations due to the delicate impulses of ethereal undulation have images incomparably more vivid and more easy of recall than sensations due to the coarser impulses of odours and flavours. The optic and auditory centres tremble under impulses which leave the centres of taste and touch undisturbed. Hence it is that we can recall a colour or a tone with exquisitely nice discrimination of shade or timbre.

CHAPTER III.

IMAGINATION.

17. We have noted the distinction between reproductive and plastic Imagination, analogous to that between Memory and Recollection, or Involuntary and Voluntary action. The creative power of Imagination, and its splendid achievements in Art and Science, have invested it with a mysterious halo, which makes many men speak of it in dithyrambs quite out of place here. And this habit of speech has biassed even scientific hypothesis. Because Imagination is commonly characterised as 'brilliant,' 'highly coloured,' &c., anatomists are found who give this splendour to certain nerve cells, "which not only absorb and retain the sensual impressions, but also elaborate and amplify them, making them appear under more vivid forms and in more brilliant colours—l'impression grandée et colorée devient par cela même dans l'esprit la représentation imagée de l'objet qui lui a donné naissance: elle s'y peint en caractères plus éclatants, s'y imprime d'une façon plus accentuée" (Luys). Obviously this splendour of colour and accentuation of form are reflected from traditional phrases about the "artistic faculty of vivid and splendid Imagination;" they are not expressions of any physiological facts. If images are reinstate-

ments of sensations, they cannot have more vividness than the originals they reproduce; usually they have much less. There are indeed minds of such easy excitability of reinstatement that to them images acquire almost the energy of sensations.

18. Dr. Wigan knew a painter who painted three hundred portraits, large and small, in one year. The seeming impossibility of such a feat was explained by the fact that he only required one sitting and painted with great facility. "When a sitter came," said he, "I looked at him attentively for half an hour, sketching from time to time on the canvas. I wanted no more—I put away my canvas and took another sitter. When I wished to resume my first portrait, *I took the man and set him in the chair, where I saw him as distinctly as if he had been before me in his own proper person.* I looked from time to time at the imaginary figure, then worked with my pencil, then referred to the countenance, and so on, just as I should have done had the sitter been there —when I looked at the chair I saw the man. This made me very popular, and as I always succeeded in the likeness, people were very glad to be spared the tediousness of sittings." No reader will be surprised to learn that this painter went mad, but in confirmation of the truth of the story Dr. Wigan saw him thirty years afterwards execute a portrait for which only two sittings of half an hour each were required, the second sitting being needed for the dress and eyebrows which had not been retained with sufficient vividness.*

19. Brierre de Boismont relates a somewhat similar

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* WIGAN: *Duality of the Mind*, 1844, p. 123.

story of the celebrated sculptor, David. One day a young man came to beg him to execute a portrait bust of his dying sister, if it were possible, without awakening in her the suspicion that she was sitting to him, lest that should create alarm. David presented himself as a jeweller's man bringing some trinkets for her inspection, and while she looked at the objects he narrowly observed her features. From this one interview he carried away an image sufficiently distinct to enable him to make a good likeness. A year afterwards the unhappy parent came to David requesting that he would again perform that feat, but this time with the young man himself, and as David was known to him the difficulty was greater. However by pretending to make some change in the furniture of the bedroom, David was introduced as an upholsterer, and by placing the mirror so that it reflected the dying man's image the sculptor was enabled to fix this face firmly in memory. Both busts were copied from images as they would have been from sensations.

20. This kind of excitability is quite special to individuals. No amount of cerebral excitement will of itself suffice. Raving maniacs no doubt often see visions and hear voices, but not always; there is a great deal of mania without hallucination. Moreover, maniacs, like sane people, are unable to call up any image they please, or to dismiss one that molests them. The rise of the image depends on a central excitation, which again has some particular suggestion in systemic states.

The power of suggestion—that, namely, of reproducing desired images with the vividness approaching sensation — is variously distributed. The wife of Professor Volkmann told Fechner that all the images she intentionally recalled were very pale and indistinct, whereas sometimes during her domestic avocations she saw her (absent) daughter standing as if actually before her with a startling reality. In men of artistic and scientific genius it is the intentional or plastic Imagination which prevails. Not only are the sensations reproduced in the order of their normal occurrence, which is Memory, they are reproduced in other combinations, as in vague Reverie or in planned Sequence. There is thus a remembrance of past experiences or a 'cerebral rehearsal' of future experiences, and tentative combinations of possible experiences. The scientific student may imagine an experiment by following a description of it, and seeing as images what actual observation would present as sensations; or by an effort of plastic Imagination he may construct a new order of images, such as never yet was presented to observation. Were it not for this facultative property of images which allows of their being recombined differently from the order of sensations, there would be no enlargement of Experience except through sensations; and probably the lower animals have only the teaching of sensation, which explains their imperfect individuality, the uniformity of their actions.

21. Imagination is the Logic of Images, as Perception is the Logic of Sensations, and Conception the Logic of Signs. Hence we deduce its office in the direction of Conduct from physiological and psychological data which leave no place for the intervention of a spiritual *agent*, mysteriously operating in what

are called the "effects of Imagination" and the "power of the Mind over the Body." This power of the Mind over the Body is frequently urged by spiritualists in proof of their hypothesis; just as the counterstatement by materialists of the power of the Body over the Mind is urged in favour of theirs. The two phrases express indisputable facts; namely, that certain bodily phenomena are consequent on certain mental states, and that certain mental phenomena are consequent on bodily states. If the pain of toothache vanishes on our entering the dentist's room, or a long-standing ailment which has resisted all the efforts of therapeutics vanishes under some strong mental impression, these "effects of Imagination" are as physiologically interpretable as the converse effects of a congested liver or alcoholic intoxication on the temper and reason, the moral changes at puberty, the mental deteriorations of old age, &c.

22. We start from the position that the Nervous System is the connecting and regulating centre of all organic activities. From among these one group is detached, and specially designated mental. If to this we add the fact that one group influences another, since all are *inter*dependent, there is nothing mysterious in the action of one group on other groups, or in the action of the others on that one. Hence since Imagination is one form of mental activity, consequently one operation of the Nervous System, it has its neural process with the inseparable discharge on the motor organs and organs of nutrition. Its influence on the Body is therefore precisely similar to that of all other nervous activities, from the simplest reflex up to the most complicated reflection.

It only excites observation and wonder in cases of unusual intensity.

23. The image which reinstates a sensation, the Imagination which is another form of Perception, must have all the motor tendencies though not the motor energy of Sensation, and may acquire the energy by increase of its own intensity. Chevreuil and Faraday exemplified this in their explanation of the divining-rod and table-turning. It was enough for the operators to have an image of the movement; that image innervated the muscles, and a slight impulse of the muscles in one direction quickly developed an energetic impulse.

To imagine an act is to rehearse it mentally. By such mental rehearsal the motor organs are, as I previously showed, disposed to respond in act. Hence it is that a long-meditated crime becomes at last an irresistible criminal impulse. Indulgence in the imagination of the act has grooved a pathway of discharge, and set up an abnormal excitability in this direction, which, like a neuralgia, is for ever irritating by its restless impulses, and can only be quieted by discharge on the motor organs. The strange calmness which often supervenes after some criminal outburst is like the satisfaction of an appetite.

24. The "influence of Imagination" though always active is rarely noticed except when the images have acquired the energy of sensations, and men commit crimes or follies impelled by imagination of the acts. Among the cited examples we may particularise those of contagion. There is the contagion of fear, familiar *to all; the contagion* of a revolutionary cry, when

masses of minds have been slowly prepared for it; and the contagion of suicide and convulsions, when masses of nervous systems have been debilitated. Examples of the latter are furnished by every hospital. M. Bochut relates how, in 1848, in an atelier of some hundred women one was suddenly seized with convulsions and loss of consciousness. In two hours thirty more were affected in the same way. By the third day the contagion had spread to 115 women, all exhibiting the same symptoms. The general pathological conditions of anæmia due to underfeeding, confinement in close air, &c., predisposed these women to such effects. At the sight of convulsions every one has sympathetic contractile tremors excited in his muscles; but in healthy states of the organism the tremors do not pass into contractions.

25. We have seen that images are reinstated sensations, not products or copies of sensations. As such they must be reproduced by neural processes essentially the same as those which produced them. But although they are due to the same neural process, and embody the same sensory, logical, and motor elements, so that there is uniformity in their laws of operation, they are conspicuously different modes of Sensibility, different phenomena of Feeling, and this difference implies a corresponding variation in their conditions of production.

To explain this, two hypotheses are tenable. Either we assume that Sensation and Imagination have two distinct seats, or organs, so closely allied in structure that the reaction of the one is very similar to that of the other; or we assume that they have the same seat, or organ, which reacts differently according to the mode of excitation. On the first hypothesis Sensation is localised in (hypothetic) sensory ganglia at the base of the brain, and Imagination in the convolutions of the brain. Although anatomically distinct, these organs are physiologically so united that any stimulation of the one is propagated to the other —the sensory ganglia exciting the cerebral convolutions, and the convolutions in turn acting downwards on the ganglia. The image is thus, so to speak, an echo reverberating from the cerebral sounding-board; and when this sounding-board is violently agitated the echo awakens a sound, the image excites the sensory ganglion to react as a sensation. This hypothesis colligates the facts with sufficient consistency to have ensured general acceptance. On grounds already indicated, I prefer the second hypothesis. The seat, or organ, of Sensation and Imagination I assume to be the Sensorium (Prob. II. chap. v.) The differences between the two modes of reaction I assign to differences in the neural units. But for our immediate purpose it is indifferent which hypothesis be adopted: the point we have to recognise is the identity of the psychological phenomena and of the physiological processes which produce them. For if the image is only a modified reinstatement of the sensation, then, since images belong to the sphere of Thought, the traditional notion of an utter separation of Thought from Feeling is for ever set aside. That we think in images and in symbols, that these constitute the chief 'content' of Thought, no one disputes; and it is only because of the marked qualitative difference between *seeing an object* and thinking it, between the sensations directly excited by the objective stimulation and the images or reinstated sensations indirectly excited by subjective stimulation, that mankind has so readily accepted the hypothesis which refers such difference to the operation of a new agent. The agent in Sensation seemed to be definitely assignable to bodily sense-organs. The agent in Thought was so mysterious that a spirit was invented, because a spirit was assumed to be in all respects different from the body.

CHAPTER IV.

CONCEPTIONS.

26. We have to show the essential community of Thought and Feeling, and also their specific diversity as Modes of Sensibility. This community and this diversity are implied in the two applications of the term Thought, as process and as product—operation and symbol. The thinking process, the logical process, is common to all psychical phenomena; the product which is specially distinguished as Thought is restricted to images and ideas (conceptions) which, although feelings in the widest sense of that term, are differenced from sensations and emotions as representatives and symbols. The feeling of colour and the imagination of it, the actual emotion of anger and the thought of it, are specifically different states.

One of the constituents of Thought we have already examined. If we found images differing in certain particulars from sensations, they were at any rate *reinstatements* of the sensations; whereas ideas we shall find to be *substitutes* of sensations, not reinstatements.

27. And first to define what is meant by idea. I shall not here occupy space with enumerating the many and various meanings which have made this word an opprobrium in Philosophy. Enough to state

that in these pages *ideas* will never stand for *images*, nor for *copies* of sensations; nor, although ideas are thoughts, will all thoughts be considered as ideas. James Mill, Stuart Mill, and Prof. Bain employ the term to express "that state of mind which remains after the sensible agent is withdrawn, or that may be afterwards recovered by the force of recollection." But this is to render the term 'image' superfluous, and to obliterate the distinctions first between idea and image, and next between image and after-sensation. Doubtless there are many cases where image and idea may be interchangeable, but there are many where "to objects so different as the images of sense and the unpicturable notions of intelligence different names ought to be given" (HAMILTON). If it be said that the term 'conception' adequately expresses these latter (and it is, I think, a preferable term), we must still remark that popular usage has consecrated such phrases as the idea of Bismarck's policy, the idea of Shakespeare's Othello, &c., conceptions which are assuredly unpicturable to the Imagination. Still more striking is the case when the idea of Infinity is spoken of.*

The image of a camel, for instance, is a reinstatement, somewhat modified, of the visual sensations. It is a thought which may enter into the chain of reverie or ratiocination. Although competent to recall other images, it is itself a definite and particular state, reproducing actual sensations. Whereas the idea (conception) of a camel is not an image at all, though it may easily suggest one; it is a symbol which signifies and condenses all that we have seen or heard of a class of animals, named camel,—fixing its place in the zoological series, its use as "the ship of the desert," &c. Any one of the multifarious details may be recalled as an image, or *none*, the symbol itself being employed as an unpictured link in the chain of thought. Images are particular, ideas are general; images are fixed, ideas are flexible. The image we have of Bismarck and the idea of his policy are both thoughts, but they are very different mental states. The idea of a million is absolutely precise, but who can form an image of it? The idea is precise, because it is a symbol which can be interpreted in precise terms.

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* The Germans have a better terminology in *Anschauung* (Beholding), *Vorstellung* (Picturing), and Begriff (Gathering-grasp).

28. To see a dog, that is, to perceive it, when our eyes are resting on a particular coloured form; to infer that a dog has passed when we see certain marks on the ground, or hear a diminishing sound of barking; and to think of a dog when it is named or otherwise suggested, are three specifically different mental states, which are due to specific varieties in the conditions affecting the Sensorium, but are alike in this, that they are interpretations of signs, and that they involve the Triple Process. The sensation-sign, the image-sign, and the verbal-sign, are not the same combination of neural elements, or sentient tremors. The image which is called up by the sound of the barking is a reinstatement of part of the group of neural tremors forming the complex feelings we have experienced; the barking has formed one of the elements of the complex, dog. The sensation and image are in so far signs, that they stand for and may call up any or all of the associated feelings, so

that by the sight or image of the coloured form we perceive a dog, the perception being a judgment more or less explicit. The word 'dog,' or its name 'Ben,' 'Pincher,' 'Flirt,' are also signs which may call up the perception, now that they have become part of the complex of associated feelings. But this sign is an artificial mark, the product, not of sensation, not of the direct physiological activity of our perceptive organs, but of social influence indirectly determining that activity. I mean that whereas the visual or auditory sensation and the visual or auditory image is a necessary and essential element in the complex perception 'dog,' the word is an arbitrary symbol substituted for all the images and sensations, integrating them, and capable of being resolved into them, but as a substitution not necessarily recalling any one of them. The word may be replaced by another; Dog may be Hund, or Chien, or Canis, without in the least affecting even the intellectual value of the symbol, or the images it recalls; whereas any change in the image or sensation determines a corresponding change in the perception.

29. Animals and infants have various visual experiences of red, blue, brown, orange, &c., each of which can be reinstated through its image. But they have no *conception* of red, blue, or orange; they have no conception of Colour, which, while *unlike* red, blue, orange, &c., includes and symbolises them. In the phrase "red is a colour" we express what no sensation of red alone can teach. Colour is not red, nor blue, nor green, nor orange. It is the sign of an operation, an abstraction from various experiences, *a logical act incorporated in a vocal act.* The organic

seat is not in the optical apparatus, but in the verbal apparatus; the logical process is not in the combination of visual feelings, but in the substitution of a verbal symbol for these: it is the comparison of a group of abstracted feelings, and this judgment unpicturable and incommunicable in any direct mode is expressed by a verbal symbol. The symbol is not only a substitution, it is conventional; not only conventional, but also abstract. Such abstraction is only possible through Language, and in Language only through verbal and numerical symbols. Images and ideas are both signs of possible sensations, but they are distinct kinds of signs, as lines and magnitudes are distinct kinds of magnitude. No aggregation of mathematical lines can make a mathematical surface, for lines are without breadth. No aggregation of images will make an idea, for images are particular and of concrete objects, whereas ideas are general, and abstracted from concretes by a special operation. It is true that we cannot imagine a line without breadth, nor a general object without particular qualities, but we can and do think these, and this mode of thinking is Ideation, Conception.

CHAPTER V.

IDEATION THE ALGEBRA OF FEELING.

30. I HAVE elsewhere said that the Logic of Signs is to the Logic of Feeling very much what Algebra is to Arithmetic. Algebra is only Arithmetic under another and more generalised form, which operates on general symbols instead of particular numbers, substituting *relations* for *values;* in like manner, Ideation is another and more generalised form of Perception, with all the differences and superiorities which result from the substitution of general relations for particular relations. Psychologists have attempted to establish an essential distinction between perceptions and ideas, on the ground that in many ideas the sensible elements are so obscure and latent that they are only inferable; while in other ideas there is apparently a direct contradiction to all sensible experience and an impossibility of sensible reduction. In the idea of Virtue, for example, the sensible elements are obscure; in the idea of Infinity, sensible experience is openly contradicted. There have also been attempts to establish a similar distinction between Arithmetic and Algebra. Yet the processes are essentially the same, the differences lie in the kind of symbols. Whether we say $2+3=5$ or $a+b=c$, the operation indicated is of the same kind; the arithmetical

formula is true only for these particular values and their relations; the algebraical formula is true for any values we please to assign, and is concerned with their relations, not with the values. Thus, also, whether we feel the redness of the rose, or imagine it, or think it, the operation of Grouping is the same process of inclusion and exclusion, only the symbols operated on differ.

31. The parallel goes further. We have noticed the intermediate position of Images, partly in the sphere of Sense and partly in the sphere of Intellect, partaking of the characteristic qualities of both with diminished intensity on the one side and circumscribed range on the other. Something of this may be noticed in Number. There are concrete numbers —two *pebbles*, three *sheep*—which closely resemble sensations. There are abstract numbers—two and three—meaning pebbles, sheep, cows, horses, or anything we please: it is with these that Arithmetic begins to be a science, *i.e.*, a generalisation and systematisation of knowledge. Like Images these abstract numbers are always definite values, but are flexible and admit of indefinite permutation and combination. Although each number will only represent one value, it will admit of being combined with any other values, and with any object. The value of an image also remains unchanged; however combined or applied it must always be that particular image, it cannot be a generalised image of other sensations. Arithmetic is limited to concrete and abstract numbers. With Algebra we enter a new sphere, that of symbolical quantities; here letters are symbols of any *values* we please; all we deal with in them is

the relations of equality which the letters symbolise. Although the values are changeable, yet, *once assigned,* they must remain fixed throughout the operation. Illogical reasoning, in philosophic as in ordinary minds, is not due to any irregularity in the normal operation, but to a departure from the values assigned.

32. The leading characteristic of Algebra is that of operation on relations. This also is the leading characteristic of Thought. Algebra cannot exist without values, nor Thought without Feelings. The operations are so many blank forms until the values are assigned. Words are vacant sounds, ideas are blank forms, unless they symbolise images and sensations, which are their values. Nevertheless it is rigorously true, and of the greatest importance, that analysts carry on very extensive operations with blank forms, never pausing to supply the symbols with values until the calculation is completed; and ordinary men, no less than philosophers, carry on long trains of thought without pausing to translate their ideas (words) into images. In both cases it is enough if the terms of the operations have their positions of relation, necessary on the one hand for an equation, on the other for an inclusion.

33. Thought is symbolical of Sensation as Algebra is of Arithmetic, and because it is symbolical, is very *unlike* what it symbolises. For one thing, sensations are always positive; in this resembling arithmetical quantities. A negative sensation is no more possible than a negative number. But ideas, like algebraic quantities, may be either positive or negative. However paradoxical the square of a negative quantity,

the square root of an unknown quantity, nay, even an imaginary quantity, the student of Algebra finds these paradoxes to be valid operations. And the student of Philosophy finds analogous paradoxes in operations impossible in the sphere of Sense. Thus although it is impossible to feel non-existence, it is possible to think it; although it is impossible to frame an image of Infinity, we can, and do, form the idea, and reason on it with precision. Nay, the paradox is demonstrable that the chief part of our scientific knowledge, so accurate and so important in its direction of our conduct, consists of ideas which cannot be formed into corresponding images and sensations, though capable of being translated into concrete terms which are images and sensations; while some ideas are as frequently at variance with sensible experience as imaginary quantities are. Spinoza remarks that we can have as clear an idea of God as of a triangle, though utterly unable to form an image of God, while able to form an image of a triangle. We have very precise ideas of Valour, Modesty, Cause, &c.; we can only have images of the several actions which the words generalise and group in abstractions.

34. The idea is often luminous and precise, where images are confused and vacillating. Nothing can be more precise than the idea of a thousand sheep, yet who could form an approximate image of a thousand sheep? It is as *operations* on quantity, not as quantities, that such ideas are precise. A thousand is the addition of 1 to 999, or of 10 to 990, or of 100 to 900. The idea of Infinity is precise because *Infinity* is not a quantity but an operation

on quantity,* the continual addition of a new term to the preceding.

The rules of Arithmetic operate in Algebra; the logical operations supposed to be peculiar to Ideation operate in Sensation. There is but one Calculus, but one Logic; though for convenience we divide the one into Arithmetic the calculus of values, and Algebra the calculus of relations; the other into the Logic of Feeling and the Logic of Signs. It is well put by De Morgan "that we cannot properly be said to *find* results in Algebra, but only to put them into the form in which they can be most easily found by Arithmetic." In like manner, we cannot strictly be said to direct actions by ideas, but only to foresee and prepare directions how to act, when sensations replace their symbols.

35. Although tradition restricts Logic to ideas, and even denies that there can be Knowledge outside ideas, all are practically convinced that the majority of our judgments remain strictly within the sphere of images and sensations. The greater part of human cognition and all that of animals belong to the Logic of Feeling. The idea of Danger is a symbol of concrete experiences which are common to animals and men; but the symbol is possessed only by man, and in virtue thereof he can be directed how to act without the presence of the concrete experiences; whereas the animal can only be moved by the actual feelings. Suppose a man and a highly-intelligent animal, a dog, are lying quietly on the grass; if either sees a certain tawny form approaching, smells a peculiar odour, or hears a low growl, he will be alarmed, for these sensa-

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* See this expounded in *Problems of Life and Mind*, Vol. II. 427.

tions are connected with emotions, are parts of concrete experience. The one sign recalls all the connected feelings which are integrated in the perception of a lion. But now suppose that neither sees, smells, hears; some one from a distance shouts "A lion!" and at once the man starts in alarm, the dog remaining perfectly undisturbed. The word "lion" is in no aspect an image of the animal, is not like any of the sensible appearances of the animal, yet having once been registered as the symbol signifying the many attributes of the animal, it replaces the perception, replaces the sensations, and recalls the image as vividly as if the roar of the lion had been heard, his odour smelled, his tawny form seen.

36. Nor does the contrast end here. The dog, although without Language, may yet be taught so to connect the sound "lion" with other feelings, that on hearing it shouted he too may have an image of the lion and be alarmed. But although the sound has thus become a sign for the dog, just as any other sound—rustle in the grass, thud on the ground, or growl—the sound is not for him a word, a symbol, an idea. It is not an abstract general sign. It cannot be thought. Whereas to the man the word is not only an abstract and general expression of all that he has seen and heard of lions, capable of recalling various experiences, but is also capable of taking its place in a connected series of thoughts without recalling any of those experiences, without reviving an image however faint of a lion—simply as a sign of a certain relation included in the complex so named. Like an algebraic symbol it may be operated on without conveying other significance than an abstract relation: it is a

sign of Danger related to fear with all its motor sequences. Its logical position suffices. A sensation can only be particular, an image can only reinstate what has been felt, but an idea generalises, condenses, and recalls all that has been generalised from the experiences of the race. The importance of this condensation of experience will appear hereafter. What we have now mainly to consider is the fact that ideas are *substitutions* which require a secondary process when what is symbolised by them is translated into the images and experiences it replaces; and this secondary process is frequently not performed at all, generally only performed to a very small extent. Let any one closely examine what has passed in his mind when he has constructed a chain of reasoning, and he will be surprised at the fewness and faintness of the images which have accompanied the ideas. Suppose you inform me that "the blood rushed violently from the man's heart, quickening his pulse, at the sight of his enemy." Of the many latent images in this phrase how many were salient in your mind and in mine? Probably two—the man and his enemy—and these images were faint. Images of blood, heart, violent rushing, pulse, quickening, and sight, were either not revived at all, or were passing shadows. Had any such images arisen they would have hampered thought, retarding the logical process of judgment by irrelevant connections. The symbols had substituted *relations* for these *values*—the logical relations of inclusion and exclusion which constitute the judgment. You were not anxious to inform me respecting the qualities of blood, heart, pulse, &c., but only of a certain effect produced on one man by the sight of another; and this effect you expressed in the physiological terms which came first to hand; you might have expressed it equally well in very different psychological terms—"fierce anger seized the man's soul, rousing all his energies at the sight of his enemy;" when assuredly there would not have been present images of 'anger,' 'seizing,' 'soul,' 'rousing,' and 'energies.' These terms are symbols which stand for clusters of images, and can at will be translated into the images; just as algebraic letters stand for values which can be assigned. But for the purposes of thought and calculation such translation is unnecessary, is hampering; all that is necessary is that the terms should occupy their proper logical position. If one term is forced into some illogical position there arises the feeling of contradiction. Transpositions are allowable so long as these do not affect the logical relations. Thus we may with equal propriety say, "At the sight of his enemy the man's pulse quickened, owing to the blood rushing violently from his heart," just as we may write $2+3=5$ or $5-3=2$. But we cannot say, "His sight quickened at the pulse of his enemy," because, unless we arbitrarily change the value of the accepted symbols, meaning by 'sight' what is usually accepted in 'pulse,' such a transposition disturbs the logical relations, and the one term no longer *includes* the other. To an English-speaking hearer such a phrase is *non*sense. There are no images of two things and three things in my mind when I say "two and three equal five;" there are simply familiar symbols having precise relations.

37. Again, suppose I read the phrase, "The ship which *carried* Nelson was appropriately named the

Victory:" unless the ship itself is the prominent interest, I have probably no image at all, or at best only a faint and fleeting shadow of some vague outline—I do not picture a man of war, I do not see the hull, masts, cordage, and cannon, though these with the figurehead, fluttering flags, and pennons, may successively emerge if I dwell on the ship. I perhaps do not see Nelson, or at any rate do not see his pale face, one eye, and one arm, but only some faint suggestion of a human form. The purpose of the phrase was not to raise images, but to communicate a fact respecting the name of a ship; and my intelligence has been occupied with this purpose. I must, it is true, have understood each word, or at any rate each clause of the sentence; but for this understanding it is not necessary that I should translate, nor even that I should be capable of translating each word into an image, or cluster of images, it is enough if I apprehend a series of logical relations. We all use occasional words with intelligent and intelligible propriety, the meaning of which as isolated terms we cannot translate. We read Shakespeare and Goethe without a suspicion of the many words which for us have no images. But if one of these words occurs in an unfamiliar connection we are at once arrested; as we are if any familiar word is placed in an unfamiliar position. Suppose we come upon the sentence, "The ship which carried Nelson was named *Victory;* the ship which carried Napoleon across the desert was named *Akbar*"—we are at once arrested; the connection of ship and desert is unusual, and is seen on reflection to be contrary to experience; but when we learn that the camel is called the 'ship of the desert,' we recognise the new value assigned to the term, and the logical correctness of the phrase is thereby recognised. There is a favourite joke among boys to ask suddenly, "Should you say 9 and 6 *are* or *is* 14?" Some answer *are*, others *is*. They do not realise the numerical relations, being preoccupied with the grammatical. But if the question be put slowly, or without sufficient emphasis on *are* and *is* to give the grammatical relations predominance, the answer is correctly made.

38. The statement that much of our thinking is carried on by means of symbols without any images, which is the same thing as thinking being carried on by words without any *meanings*, and with only the accompanying intuition of their logical relations, will perhaps meet with some resistance. It is so important that I must dwell on it.

Remember that a word is a conventional attribute—the mark of an object or an action, having the power of recalling the images which constitute our knowledge of that object or action, but substituted for these absent images, standing for them, as one image recalls and stands for the absent others. If I have experience of the brittleness, coldness, smoothness, sonorousness, &c., of glass, the sight of a glass which is that of a coloured form may recall any one and all of these experiences, but habitually the sight will not recall them, or recall only such as are relevant to the particular action or train of thought in which I am engaged. Unless there be some indication of the glass being broken, I do not in seeing it, or imagining it, think of its brittleness; if this quality of brittleness is suggested by the sight or image of the glass, it is because of the relevance of this image to the series of present circumstances, or to the series of my thoughts. The sight of the glass determines my movements—I avoid touching it, or I move it aside, just as the subconscious perception of many surrounding objects which I do not pause to distinctly perceive helps to determine my movements. They have their position in my orientation. They act upon me as real agents, though I do not realise their *meanings* any more than I realise the meanings of some words in a sentence, though these words form constituent elements of the sentence. If therefore the sensation of an object can have its determining agency without recalling the images of other sensations constituting our experience of that object, and if one image can have this agency in determining thought without recalling other associated images, the perception of the object being an integration of these various feelings and as such their representative, this is still more strikingly the case with ideas, which are symbols and substitutes, and which because they have none of the sensible qualities of the feelings they symbolise, but are only associated with them, are less prone to resolve themselves into their significates. To express it physiologically, ideas are sympathic states, images are idiopathic. The verbal symbol 'horse' which stands for all our experiences of horses serves all the purposes of thought without recalling one of the images clustered in the perception of horses, just as the sight of a horse's form serves all the purposes of recognition without recalling the sound of its neighing or its tramp, its qualities as an animal of draught, &c.

39. In previous volumes I have several times remarked that metempirical philosophers are like analysts who refrain from assigning values to their symbols. It is evident from what has just been said that the greater proportion of all men's thinking goes forward with confident reliance on the correctness of logical operations, and with only an occasional translation of symbols into images. The translation—verification—does indeed from time to time take place, and always in proportion to the novelty of the connections; but how easily and how fatally the mind glides along the path of logical operation without pausing to interpret more than the relations of the symbols is humorously illustrated in the common story of a physicist, whose claim to omniscience was the joke of his friends, being asked earnestly whether he had "read Biot's paper on the malleability of Light?" "No," he replied; "he sent it me, but I have not yet had time to read it."

40. This insistance on the fact that much of our thinking is carried on by means of symbols (words) and not by means of images—by Ideation, and not by Imagination—will not be misunderstood as implying an independence of Thought and Feeling. The symbols are modes of Feeling, representatives of images and sensations. Our thought is a constant interchange of ideas and images; some trains of thought being carried on mainly by images more or less vivid, others mainly by ideas with only a faint escort of images. If I think of Rome or Florence, these objects become more or less pictured in some of their aspects; but if I think of my return home from *Naples*, Rome and Florence are realised simply

as points in the route, and no picture of either may arise, the names sufficing to carry on the train of thought; or instead of being thus mere terms in one series, they may be objects of another series. The idea of Rome expands into the image of the city from this or that point of view, and this general image expands into particular images of the Porta del Popolo, the Corso, the steps of the Vatican, the Forum, &c. And so with Florence. In thinking of a lion, it depends on circumstances whether the idea 'lion' remains a symbol or expands into some of the images symbolised. At first the image will be only a sketch of the tawny form; this sketch will gradually assume more and more fulness of detail: the tawny coat shows its faint tiger stripes and darker back; the shaggy mane and boss of hair at the tail-tip; the yellowish eye with its vertical pupil; the huge claws, the hot breath, the peculiar odour, the grace of movement, successively appear. These are all recalled by the word 'lion,' because that word is a sign with which each of these images is associated. The images reinstate their sensations, and thus symbols *carry consequences* in the same order as sensations.

41. The logic of animals is the same operation as the logic of men; but it is performed on sensations and images only, not on sensations, images, and symbols. A wolf draws the logical conclusion that his prey is near at hand when the scent reaches him, and concludes that his prey is moving towards him, or away from him, according to the increasing, or decreasing, energy of that scent. By such conclusions the wolf regulates the speed and caution of his approach. But the wolf is incapable of detaching this logical process

and reflecting on it—of throwing it into the form of a proposition. Nay more, the wolf is incapable of drawing such conclusions and regulating his actions in the absence of such sensations. The man who can throw his experience into the form of a proposition, and regulate his actions by words in lieu of sensations, employs the same Logic though operating on different terms.

"A parrot" says Mr. Max Müller, "will take up a nut, and throw it down again without attempting to crack it. He has found that it is light; this he could only discover by comparing the weight of the good nuts with the bad; and he has found that it has no kernel; this he could only discover by what philosophers would dignify with the grand title of syllogism, namely: 'All light nuts are hollow; this is a light nut; therefore this is hollow'" (*Science of Language,* 1871, I. 401).

42. Those who deny Logic to animals because animals are incapable of forming abstract conceptions and employing symbols as substitutes for images, forget how much of our own thinking, that is, our judgments and direction of conduct, belongs to the Logic of Feeling. I have already illustrated this, but the point is sufficiently important to warrant a renewed statement. We know a friend, seen at a distance, by something in his gait which is a registered sign, though we are quite incapable of specifying it; this sign connected with other feelings which are signs of our friend calls up his image, as they would do. We cannot *name* it, but we *feel* it nevertheless; and hence we say, "I don't *know* what it was, I can't *think* what *made* me recognise you, but I felt it was you."

Captain Head tells how one day when he was crossing the Pampas his guide suddenly stopped, pointed upwards to the sky and shouted 'lion!' Now lions do not prowl about the sky, and the puzzled Captain looking up saw not a lion but condors soaring in a circle over a particular spot far off. On riding to it, they found a dead horse, and devouring that horse a lion; the condors enviously looking on from their airy height. The peculiar appearance of the condors was to the guide a suggestion of the lion's presence as much as the sound of its roar would have been. This inference he could have stated in words, giving it the form of a proposition; and his hearers could have made that proposition part of their knowledge, so that the phrase, "Whenever condors are seen hovering over a particular spot, there will be a carcase which attracts them and a wild beast or man beside the carcase, which prevents their descending on the carcase." An observant bird would connect his imaged experiences so as to be guided by the same inference; but would be incapable of communicating this inference to other birds, though it might by sounds and actions communicate the associated feelings of alarm and caution.

43. In the Logic of Verbal Symbols we have seen how the ideas replace the experiences they symbolise, so that trains of thought are carried on without the intervention of images. In the Logic of Feeling we see how images replace the experiences of which they are single elements, so that there is no need of the intervention of these other elements; and how sensations serve as connecting links without the intervention of images. Let me cite a case. It is my custom

during my residence in town to carry a latch-key in my trouser-pocket. Whenever I approach my door, no matter how engrossed my attention may be by other subjects, I automatically take out the key. In the country no key is carried. Nor do I even find myself feeling for it in my pocket on approaching my door. But the other day I had the key of a portmanteau in the pocket, and as I approached the door I found myself drawing out this key. The sensation produced by the presence of the key was enough to set going the automatic train of feeling and action.

44. The result of the preceding observations may be thus expressed. Thought, in the sense of Ideation, is to Feeling what Algebra is to Arithmetic. The Logic of Signs is the same operation as the Logic of Feeling; but it is an operation performed on abstract signs in the one case and on concrete signs in the other. Sensations are signs and images are signs, but they are concrete signs and constituent elements of the complexes they signify—the sensation of colour and the image of colour being portions of the individual experiences constituting an object of perception. Whereas ideas are verbal symbols, abstract signs, not portions of the individual sensible experiences, but formed out of different elements, and substituted for the groups with which they are associated. Sensations and images are formed according to physiological and psychological laws. Ideas are formed according to physiological, psychological, and sociological laws. The one is the product of the organism in relation to the Cosmos; the other the product of the organism in relation to the Cosmos and to Society.

CHAPTER VI.

THE POTENCY OF SYMBOLS.

45. ALTHOUGH Thinking is effected by the connection of feelings of all kinds, whether sensations, perceptions, intuitions, images, conceptions, or emotions, and as a process is the fundamental process of grouping sentient tremors, Thought is usually understood to be restricted to the combination of intuitions, images, and conceptions which are the representatives of the various feelings under ideal forms, the sensible elements of which are rather latent than apparent. In this consists the popular antithesis between Thought and Feeling.

46. That animals think, that is remember, imagine, judge, and reason, as men do, may nowadays be considered to be beyond discussion. But they are incapable of one supremely important mode of thinking—the formation of conceptions, and the combinations of series of feelings by means of verbal symbols. This, to which the name of Ideation may specially be given, is the distinguishing attribute of man, and is due to his possessing Speech, which we shall presently see is a *social* not a *physiological* product. Language in its widest sense cannot be

denied to animals as a function of expression of feelings—the language of gestures and cries is even made by them a rudimentary function of communication. But this function never becomes a faculty, and above all never rises to the expression of ideas, the communication of knowledge.

47. It is the power of thinking by means of symbols which demarcates man from animals, and gives one man or nation the superiority over others.

The animal feels, thinks, and acts; but no animal spends his unoccupied hours in framing theories, in devoting his energies to the discovery of what was the order of past events, and will be the order of events to occur long after he has passed away. He does not watch the course of the stars, the growth of societies, or record the deeds of his ancestors and companions. Sympathetic as the dog is, and terribly fond of fighting, his intense interest in the fight which he can only see, not share, might be also excited by the mental vision of such a scene, were there any means of making the invisible visible by signs; but that which a man can see in a narrative, the dog can only see in action. The narrative will last for centuries and be intelligible to millions. The visible event lasts but for a few minutes and is irrecoverable. For the animal there is no record. The deeds of his race pass away like vapour: *vate sacro caret.*

48. Animals have language, but it is individual not social. They communicate only feelings, as their Logic is only that of Feeling; they cannot communicate knowledge of objects, having no ideas of objects, no Logic of Signs. When a dog is shut in a room

and wants to get out, he whines and scratches at the door; these are reflex expressions of his feelings, and having learned that whining is often followed by the door opening, he expects that if he whines the door will open. It is the same when he desires food. This rudimentary stage of the use of vocal sounds as signs of communication between him and his master remains, however, so rudimentary that he never generalises it beyond his actual experience—he does not whine to his fellows, nor does he whine to escape punishment, &c. And the communication is never other than that of desire. Objects, except as motives, do not exist for him. He has no power of Abstraction capable of constructing ideas of objects, he has only Sensation and Imagination representing sensibles. But ideas, expressed in words, are not sensible objects; they are mental constructions, in which Relations abstracted from Things are woven afresh into a web of sensibles and extra-sensibles, and concrete particulars become concrete generals. The experience of red is detached from the sensible experiences which originally accompanied it by being separately named. Red is then any red. Never being isolated in experience, Red could only be isolated in thought by means of some sign which should give it separate embodiment; the sign thus particularising it, separating it, can, by virtue of this detachment be applied on all similar occasions. The particular thus becomes generalised, and may become a sign of other qualities held in common by red objects.

49. It is sometimes said that we only know what we can name. This is not correct. But if we can

know the unnamed we can only communicate our knowledge through names. What makes the mystery of Consciousness, of Feeling, of Existence? Precisely this, that we can only name them by metaphors—reflect them in the mirror of comparison. What makes the wealth of knowledge? Precisely this, that we can name an infinite variety of distinctions—describe an object by enumerating its qualities, a thing by its relations, a subject by its predicates. To the animal and the infant there is but knowledge of particulars; the subject and predicate are one for them. Objects therefore—in one sense—do not exist for them—only feelings connected with external signs. To us feelings with external signs are *attributes*, qualities of objects; but this is because we have reached the abstraction of *objects*, apart from their felt attributes—in logical phrase, the distinction between subject and predicates—and to us objects are not only present feelings, but syntheses of past and present; and these syntheses are reconstructed particulars which are detached from their surroundings and are made to enter into new constructions. We construct conceptions at first as birds construct their nests, gathering materials from far and wide; but we afterwards go beyond this, and use the nests as material for larger constructions.

50. A child and a dog see each a lump of sugar, touch it, taste it. The taste being agreeable, when afterwards the child sees a lump of salt or of chalk he unhesitatingly puts it in his mouth. Not so the dog. The reason is that the dominant quality determines the action; and for the dog the dominant quality is scent, not colour: it is with scent that the

feeling of taste is associated, and any object having the odour of sugar would be eaten by the dog no matter what its colour; whereas the child is guided by sight, and any object having the aspect of sugar would be eaten, but sugar itself if brown or red would fail to attract. A child is easily deceived by a change of aspect: let his father or nurse appear in a strange costume, and he will cry as at a stranger; but no change of costume affects the dog. When Ulysses in rags is recognised by his dog this is not due to a deeper-sighted affection, but to a wonderful power of smell; for the dog is more dependent on his sense of smell than on his sight.

51. While animal and child are thus alike in obeying the impulse of a dominant feeling, and blindly concluding that where this is present there also will be the other feelings formerly accompanying it, let us now observe the wide difference which arises with Language. The white object receives a name, sugar, and the pleasant feeling accompanying its pressure on the tongue is named sweet. Henceforth these names are equivalent to perceptions. Any object that is called sugar, or is said to be sweet, however it may vary in aspect, will be put into the mouth in security. The name has become a dominant quality —a sign of the unfelt qualities. It is capable of determining action, and reviving remembrances in spite of the most complicated and dissimilar appearances; it has the power of sensation where all the sensible impressions are different. So mighty is this power of names that even highly-cultivated people habitually pursue courses which would be repugnant were they not called pleasures. We swallow as deli-

cacies what as medicine would cause wry faces. The animal has no such power, no such weakness. Guided by his sensations alone, he cannot be made to disregard these, and rely on signs; and this deficiency in the use of signs renders him incapable of abstraction and generalisation.

52. The child at first no more mistakes a wooden horse for a live horse than the dog does. Interpreting the visible signs without the aid of symbols, both child and dog see no resemblance in the wooden horse to the huge live animal. But no sooner does the child associate the name of *gee-gee* with this wooden horse, than the name as a *dominant* revives the images of horses: the preperception of the living animal is thus brought to bear on the perception of this wooden toy. Not that the child confounds the two; he is perfectly alive to their visible differences; but the identity of name acts in his construction of the object, and symbolises invisible qualities. Hence it is that the child seems to believe the wooden toy to be alive, and to have all the qualities it knows of horses. The toy is fed, caressed, and beaten; not, as we commonly suppose, owing to a conscious fiction of the child, but by an identification through identity of name. It is the same process so curiously manifested in the fetichism and superstitions of savages.

53. Language by its generalisation enables us to construct *objects*—in the philosophical sense of the term—by separately naming, and thus giving separate ideal existence to, those feelings of a group which are invariable and predominant, as distinguished from the feelings which are variable and accidental. That is to

say, the separation of subject and predicates, substance and attributes, object and qualities, thing and relations. No such separation can take place in the mind of the animal, nor in that of the infant. In consequence of this they are both secure from one of the deepest and most disastrous of speculative errors. Deficient in the mighty instrument of generalisation they are preserved from its misuse.* To animal and child, as we have said, subject and predicates are one. It is the word that separates them. The separation once effected, the word *replaces the subject.* It is the *sugar* which is sweet, bright, rough, &c. The sugar is the *object*, sweetness, brightness, roughness, are its *qualities*. The name from a dominant sign has come to be the symbol of what is *real*, persistent, independent of sense. The abstraction is personified. It is difficult to believe that the word does not represent a real, and thus Ontology arises: the idea of substance, one of our numerous abstract ideas most frequently employed, is supposed to stand for a Noumenon underlying phenomena, and altogether different from them. The early speculators were unable to imagine the Earth swinging unsupported in space. They had no experience of huge solids without firm supports. Hence under the earth they placed the shoulders of the giant Atlas on the back of the huge elephant, who in turn stood on the back of a tortoise; what the tortoise stood on they deemed it needless to inquire: somewhere the mind must pause, and it paused at the tortoise. Modern science not only got rid of these supports, but found no difficulty in conceiving the earth to swing free in space, held there in virtue of the Attraction of all its particles for the particles of the sun. The material support of an unknown cause was replaced by the synthesis of known forces, the convergence of all the separate particular movements. In like manner modern philosophy banishes the old notion of substance, or Noumenon, replacing it by that of a synthesis of Qualities or Relations.

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* CLAVEL: *La morale Positive.*

54. The same may be applied to all abstract ideas, Law, Life, Cause, Force, Soul, &c. These are general expressions to indicate a cluster of particulars and personified abstractions indicative of metempirical existences. They are only possible through Language; and to a great extent may depend on the Language of verbal symbols. For although the deaf and dumb cannot be said to be wholly without abstractions—due, I suspect, mainly to inheritance from speaking parents and to tuition from speaking contemporaries—yet it is well known that their power in this way is very limited, and is mainly that of sensible generalisation. Mr. Tylor says:

"To 'make' is too abstract an idea for the deaf mute; to show that the tailor makes the coat or that the carpenter makes the table, he would represent the tailor sewing the coat and the carpenter sawing and planing the table. Such a proposition as 'rain makes the land fruitful' would not come into his way of thinking; 'rain fall, plants grow,' would be his pictorial expression. As an example of the structure of the gesture language I give the words roughly corresponding to the signs by which the Lord's Prayer is acted every morning at the Edinburgh

Institution for Deaf and Dumb. . . 'Father' is represented by 'old man'; 'name' is touching the forehead and imitating the action of spelling on the fingers, as if to say 'the spelling one is known by.' To 'hallow' is to 'speak good of' ('good' being expressed by the thumb, while 'bad' is represented by the little finger); 'kingdom' is shown by the sign for 'crown;' 'will' by placing the hand on the stomach in accordance with the natural and widespread theory that desire and passion are located there. 'Done' is 'worked,' shown by hands as working. The phrase 'on earth as it is in heaven' was shown by the two signs for 'on earth' and 'in heaven' and then putting out the two forefingers side by side, the sign for similarity and sameness all the world over. 'Trespass' is 'doing bad;' 'forgive' is to rub out, as from a slate;" * and so on. Again; "A deaf and dumb child does not ask, '*What* did you have for dinner yesterday?' That is too abstract; he asks, 'Did you have soup? Did you have porridge?' and so forth. He expresses a conjunctive sentence by an alternative or contrast. Instead of saying, 'I should be punished if I were lazy,' he says, 'I lazy, no; I punished, yes.' It is only—as Steinthal says—the certainty that speech gives to man's mind in holding fast ideas in all their relations which brings him to the shorter course of expressing only the positive idea and dropping the negative." †

55. This power of separating the various aspects of things and fixing them in names is the source of our mental superiority. We are not to suppose that the

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* TYLOR: *Researches into the Early History of Mankind*, 1865, p. 32.

† *Ibid.*, p. 28. Clavel, 90, 91. Steinthal, 472.

animal makes no distinction corresponding to that of subject and predicates; he must certainly distinguish between a man moving and resting, patting him and kicking him, and so form a rudimentary notion of fixed and transitory qualities. But this lies in the obscure region of the Logic of Feeling; and his *interests* do not impel him to generalise. He lives in the present feeling, and only discriminates what obviously concerns the present feeling. Like man he has different feelings, each of which has its *signature;* but comparatively few of these are *localised,* so that his perceptions are restricted to what immediately interests his appetites. I have shown already that the physical basis of abstraction lies in the signature consequent on the speciality of the sensory organs and the numerical order or power of the neural units. These signatures become localised, and perception results; the localisation may be in some spot of the surface of the organism or in some spot of the projected surface called the external world. Here ends the animal logic. But man carries the process further, and localises signatures in symbols or names; and with these his logic operates. Note, in passing, how infinite and subtle are the distinctions he has been enabled to localise and fix in names, how by them he not only connects present with past and future, and constructs the life of the world and humanity, but how he is led by them to make minuter and minuter subdivisions, to extricate from the complexity of confused feeling the most delicate elements, and to construct in the sphere of sense a world of objects to which animals are blind and deaf. Our progress is a continued discrimination and re-identification. We are for ever seeing some new fact, some new quality, and again recombining it with others, so as to bring together in a living synthesis objects that at first seemed wide as the poles asunder. We note a dark line on the solar spectrum. What can be more trivial? Lo, it reveals the presence in the solar atmosphere of a metal familiar on our earth! No animal would observe the dark line; no man would observe it, had not Language by its accumulation of definite observations through centuries of culture been a Sixth Sense, enabling him in perceiving the word sodium to perceive the complex cluster of qualities which that word symbolises.

56. Ideas are verbal symbols. The power such ideas have over feelings and actions is incalculable. Think, for example, of the influence of the idea of Death. Yet no animal can form such a conception. He sees his companions and children become motionless, and rot. But he has no means whereby he could generalise these experiences and imagine himself liable to a similar fate; for he has no means of identifying his organism with that of others, no means of connecting remote causes, no means of conceiving a future. It is Language which records and generalises experience and opens a vista of experiences about to be; and it is this power which makes man the only melancholy animal, and the only *moral* animal. The idea of Death overshadows but it also ennobles Life. It underlies all our planning, connects our actions with the lives of th
who are to succeed us, and moulds our con
the world and of our relations to the
which rule it.

57. Language is to the Social Organism very much what the Nervous System is to the Body—a connecting medium which enhances all its functions. It links together man with man, tribe with tribe, nation with nation. As the neural process active to-day prepares the way for other processes to-morrow, so the name given to an object or event not only serves to record the fact but to connect it with other facts, and out of this very connection new light radiates. By means of the nervous system whatever is going on in the most distant parts of the organism becomes influential over the others. By means of Language what was experienced in distant lands and far-off times becomes an influence on the children of our land and time. If the wars and revolutions in Asia affect the cotton-spinners in Manchester—if the abstruse and seemingly idle meditations of Greek geometers on the properties belonging to sections of a cone have determined the Commerce of Europe with Asia, Africa, and America—these things have been possible only because there was Language to frame conceptions and to record them.

The development of ideas is but another aspect of the growth of Language; indeed, the history of culture may serve to convince us that we have still only a rudimentary understanding of the reach and potency of symbols. The immense superiority, intellectually considered, of images over sensations, is their flexibility of combination and permutation. The superiority of ideas over images is their generality. A
condenses in a single point experiences which
finite expansion. It is like one of those
dustry which condense the labours of a

thousand arms in the stroke of a piston. The invention of a new symbol is a step in the advancement of civilisation. Why were the Greeks, in spite of their penetrating intelligence and their passionate pursuit of Science, unable to carry Mathematics further than they did? and why, having formed the conception of the Method of Exhaustions, did they stop short of that of the Differential Calculus? It was because they had not the requisite symbols as means of expression. They had no Algebra. Nor was the place of this supplied by any other symbolical language sufficiently general and flexible; so that they were without the logical instruments necessary to construct the great instrument of the Calculus. They had carried Geometry to an advanced stage. But then Geometry is—as Gauss profoundly said—"a science of the eye," and many of its propositions are evident in a simple intuition (such for example as that two sides of a triangle are greater than the third), whereas an algebraic proposition equally simple, and equally evident when demonstrated, always requires demonstration—no student sees at a glance that $(\sqrt[n]{a})^n = a$: the symbols must be interpreted for him.

58. The happy notion of expressing quantities and the operations on quantities by conventional symbols, instead of presenting actual magnitudes for the one and actual processes for the other, or of representing the magnitudes by figures and the operations by phrases, was the brilliant notion which changed the whole range of science and gave Mathematics its best instrument. Geometry expresses quantities by natural signs, *e.g.*, a line by a line, a circle by a circle, an angle by an angle; it e[illegible]s the operations b

phrases. How laborious this method of expression becomes when the propositions are complicated every student knows, especially if he has looked into the Greek writers, and been bewildered by their demonstrations, which the facilities of algebraic notation render so simple.* The substitution of the conventional symbols for the natural signs, and the application of such symbols both to the quantities and the operations, have been of immense influence. Consider for a moment the expression

$$x^3 - ax^2 + b^3 = 0$$

here the letters a, b, x, denote quantities; but x^3, ax^2, b^3 denote certain operations performed on these quantities, no less than the quantities themselves. Now to represent these quantities by figures, and to describe the operations in phrases, would not only be a laborious procedure difficult to follow, it would lead inevitably to misconception. The conventional symbols condense all the scattered rays into luminous points, and make the demonstration easy and unambiguous.

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* "La principale cause qui rend l'analyse ancienne insuffisante dans les questions d'un certain ordre est son assujetissement nécessaire à une suite de raisonnements développés. Si l'on ne peut les suivre qu'avec peine, à plus forte raison ne les peut—on former sans une contention extrême d'esprit, sans les efforts extraordinaires de mémoire et d'imagination. Le premier pas à faire pour mettre l'analyse en état de surmonter ces difficultés était donc d'en changer la forme et de soulager l'esprit de ce fardeau accablant de raisonnements—L'arithmétique et l'algêbre nous offrent des exemples. Car qu'est ce qu'une opération arithmètique sinon un procédé mécanique pour la plûpart des hommes, mais qui est cependant le tableau et équivalent des opérations laborieuses auxquelles l'esprit serait reduit sans ces secours." MONTUCLA : *Histoire des Mathématiques*, II. 75.

"Les anciens abordaient les questions de front avec leur géometrie imparfaite, et les yeux dont tout homme est pourvu. Au contraire les modernes ont compris qu'il fallait développer le procédé du calcul pour l'appliquer à l'astronomie et à la physique, et ils ont dû inventer le téléscope, le microscope, le thermomêtre, et bien d'autres instruments pour mieux observer ou mieux experimenter." DE CANDOLLE : *Hist. des Sciences et des Savans depuis deux siecles*, 1873, p. 70.

59. How the advance of Science is connected with methods of Notation (which is an extension of the primitive process of Naming) is manifest in the fact that the Greeks were arrested in their course precisely at the point where their Notation failed them. They had a very imperfect system of Arithmetic and no separate Algebra. They were therefore incapable of extending their Geometry by analytical methods, and what they knew of Algebra itself was little more than a deduction from Geometry. De Morgan points out that the names still given to aa, aaa, ab, carry the traces of their geometric origin; namely, the *square* of a, the *cube* of a, and the *rectangle* of a and b. Now just as ideas (words) are abbreviated expressions of generalised feelings, so the symbols of Algebra are abbreviated expressions of the relations of quantities. Because of its generality each is capable of extension, because of its abbreviation each works with diminished friction. The slow progress of Analysis, in early days, was owing to men working with an instrument of which they did not suspect the range. They employed a language which, as Playfair says, "expressed more than they were prepared to understand, a language which under the notion first of negative and then of imaginary quantities seemed to involve such mysteries as the accuracy of mathematical science must refuse to admit." Nor is this wonderful. Even long after Algebra had been constituted and its triumphs assured through the discovery of its principal methods, even

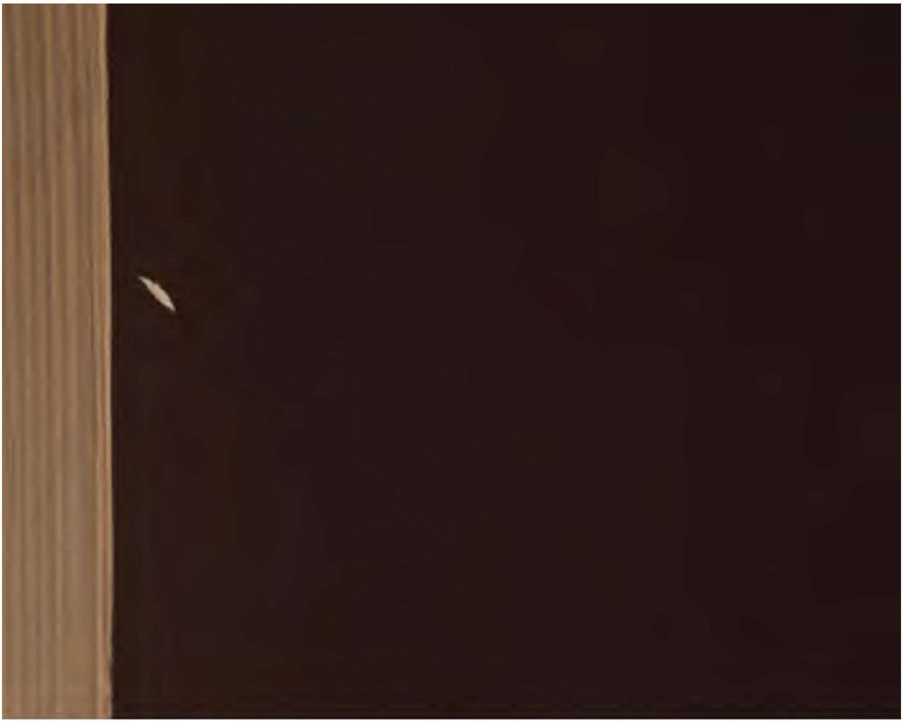
after its application to Geometry had opened such glorious vistas to research, the full powers of this great Instrument were unsuspected until the fertile and ingenious Euler detected them.*

60. The great Lagrange specifies among the many advantages of algebraic notation that it expresses truths more general than those which were at first contemplated, so that by availing ourselves of such extensions we may develop a multitude of new truths from formulæ founded on limited truths. A glance at the history of science will show this. For example, when Kepler conceived the happy idea of infinitely great and infinitely small quantities (an idea at which Common Sense must have shaken its head pityingly), he devised an Instrument which in expert hands may be made to reach conclusions from an infinite series of approximations without the infinite labour of going successively through these. Again, when Napier invented Logarithms, even he had no suspicion of the value of this instrument. He calculated the tables merely to facilitate arithmetical computation, little dreaming that he was at the same time constructing a scale whereon to measure the density of the strata of the atmosphere, the height of mountains, the areas of innumerable curves, and the relation of stimuli to sensations.

61. The facilities of Notation enable Thought to be carried on with an ease and extension which have an analogy in the facilities afforded to Commerce by the manifold symbols of Credit. We are not incessantly called upon to excha r money for the food it represents, nor t rds into the sensa-

tions they symbolise. It is enough that we *can* do so; and a continuous assurance of the relations supplies the place of the values. No one in handling, paying, or naming a sovereign thinks of it as representing 240 pence or 960 farthings; he is quite assured of it as representing a strictly defined relation of values, and he deals with this compendious unit either as a group of twenty shillings, a group of four crowns, or as the unit in a larger sum.

THE END.



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